Contents

Theme 9

Theme 11

Theme 12

Introduction

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Since the Tbilisi Principles on education and environment were released in 1977, environmental education has created many opportunities for critical and creative thinking, teaching, learning, awareness raising and action taking. The theme of the 2007 World Environmental Education Congress was '*Learning in a changing world',* inspired by the knowledge that one of the most constant features of life today is change. It recognised that globalisation and internationalisation are among processes that have created a world context of uncertainty, flux and risk, and that schools, community organisations, business and governments around the world are challenged to respond to unprecedented and complex economic, political, social and environmental changes. The Congress theme also reflected that traditional forms of teaching, learning and awareness raising are changing to incorporate new concepts and life-long learning approaches. It drew attention to the fact that people everywhere are learning in a changing world.

The WEEC 2007 was hosted in Durban, South Africa, by the Environmental Education Association of Southern Africa (EEASA), and the Wildlife and Environment Society of South Africa (WESSA). It provided a platform for questions on the nature and contribution of environmental education to be deliberated. Overall, the WEEC 2007 raised many questions about the kinds of education that are needed, the learning processes that work best, and ways in which we can continue to monitor our practice in the field of environmental education (which itself is changing) as the world around us changes.

To capture just a 'taste' of the rich interactions that took place at the WEEC 2007, EEASA is publishing this Monograph. Its purpose is not to replace the conference proceedings [which have been made available on the EEASA website (www.eeasa.org.za)], but to present readers with a smaller selection of papers that reflect innovative environmental education practice and research across diverse sectors and contexts. The final Congress programme presented an interesting array of more than 400 different contributions, some of which were theoretical and speculative, while others were more practical and empirical. All, however, were imbued with the values of seeking greater clarity on the global project of strengthening environmental education processes for a more equitable, just and sustainable society. This monograph is therefore dedicated to the WEEC 2007 Congress theme - *Learning in a Changing World*.

The 26 papers that have been selected for this monograph span 10 of the Congress' 13 sub-themes. Some sub-themes are more strongly represented than others, and the papers are extremely diverse in both focus and content, which reflects the wider content and focus of the WEEC 2007. To allow for continuity with the way that WEEC 2007 was organised, papers have been arranged according to the sub-themes in which they were presented at the Congress.

The sub-themes for the WEEC 2007 were:
Theme 1- Environmental education in the UN Decade on Education for Sustainable Development
Theme 2- Environmental education, ethics and action
Theme 3- Environmental education, training and life-long learning
Theme 4- New learning theory and approaches
Theme 5- Research, innovation and evaluation
Theme 6- Globalisation, internationalisation and environmental education
Theme 7- Ecological integrity, society and environmental education
Theme 8- Environmental education, policy and curriculum transformations
Theme 9- Environmental education, social justice and socio-ecological change
Theme 10- Environmental education and the WEHAB (Water, Energy, Health, Agriculture, Biodiversity) agenda

Theme 11- Environmental education in contexts of poverty, risk and vulnerability
Theme 12- Sustainable schools and learning institutions
Theme 13- Cultural changes and environmental learning

WEEC 2007 provided an international platform for environmental educators, practitioners and researchers to come together to engage with issues of education and learning in a changing environment, education for sustainable development (ESD), and the challenges of implementing environmental education and now ESD. Since the WEEC 2007 was located at the southern tip of Africa, in one of the most poverty stricken areas in the world, but also an area that has enormous cultural, social and natural wealth, the WEEC 2007 conference participants engaged in dialogue about issues of globalisation, poverty and new approaches to teaching and learning.

Many challenges facing environmental education were also raised in the deliberations, particularly in relation to the much debated relationship between environmental education and education for sustainable development. ESD, it was said, is a contested and misunderstood term that is open to many interpretations, and as many appropriations. The debates and uncertainty surrounding the identities and contributions of ESD and environmental education are reflected in a number of the papers in this Monograph and captured in this quotation from Wals: "After twenty years or so of talk about sustainability and sustainable development, both in theory and in practice, it has become clear that there is no single outlook on what sustainability or sustainable development means". One of the ways of approaching such contested discussions that arise from semantics, is to engage with *practices* that integrate environment and sustainability thinking into educational processes across all levels, phases and sectors of education.

The discussion on Education for Sustainable Development, as can be seen across the papers in this Monograph, raises a number of substantive questions about the purpose of education, and the need for changes to be made in education. Robinson and Shallcross, for example, pose the question: "Is a decade of teacher education for sustainable development essential for survival?" They consider some of the challenges to Education for Sustainable Development in differing contexts (from India to the Caribbean to Canada) and provide insights into how the reorientation of teacher education might work in different contexts. They argue further that if education is to address sustainability it has to be transformed rather than reformed. Puntenney, also thinking along similar lines about substantive reform in education, suggests that the interface between environment and education for sustainable development requires connecting diverse cultures and diverse knowledge systems as people strengthen their capacity to make sustainability part of everyday life. Ketlhoilwe's paper stimulates debate on sustainability issues and their implications for teaching and learning that promotes social transformation in the UN Decade of Education for Sustainable Development. He argues that teaching of environment and sustainability issues should not be compartmentalised into academic subjects to be talked about in classrooms and schools, but that environment and sustainability issues should be oriented in such a way that they affect social change that not only benefits humans but also the natural environment. In effect, he argues for a change in educational purpose and practice.

The papers also encompassed discussions on values and ethics. These questions are not easy to address. Just how should people make ethical and value-based decisions or compromises between present desires and coming needs while pursuing a more sustainable future for the planet? Öhman, writing from Sweden, suggests that one of the main challenges facing education for sustainable development is how we prepare coming generations to deal with value-related compromises. He suggests a pluralistic approach which strives to avoid the risks of indoctrination by promoting students' critical thinking and their competence to act**.** Writing from South Africa, Olvitt argues that environmental education needs a stronger understanding of ethical issues. This is necessary to respond to natural resource management debates in new ways as the environment cannot be disentangled from social reality and people-environment relationships. She proposes a pragmatic and open-ended approach to environmental ethics, in which ethics is seen as a 'process of enquiry and critical thinking' and not indoctrination, preaching or inducting learners into a particular code of behaviour.

Not only were the debates centred on the relationship between environmental education and education for sustainable development and how to interpret this, and on the significance of ethical deliberations in education, they also encompassed discussions on what this means in different educational settings. One of the key features of today's 'changing world' is the form that teaching takes. Traditional forms of teaching, learning and awareness raising have changed radically over the past decades to incorporate new concepts and life-long learning with new pedagogical approaches and 'delivery modes' which have been facilitated with the rise of information communication technologies and the communications revolution. Teaching and learning also take place in a wide variety of 'learning sites'.

While the forms of education and learning are evolving, organisational and workplace learning environments are also changing. Lane reports on the success of the KEEP project – a state-wide education programme in the USA designed to develop, implement and evaluate energy education efforts. She explains that KEEP focuses on teacher empowerment and supporting teachers to integrate energy education into their school curriculum. In another story of changing educational practice, White describes how a new course design initiative called 'Environmental Awareness: Techniques and Training' (EAT) was developed and implemented in a South African university. EAT is an innovative cross-cutting environmental elective course which allows undergraduates to gain invaluable experience while they learn.

Traditional education approaches have tended to focus on either learners (children or youth) or adult training, but what about the people children interact with most regularly? Cutting and Cook examine the important role that parents play in children's learning. By encouraging parental participation, they found there was an improved confidence of parents and learners, which promoted a mind set that was more conducive to environmental activism.

Closely linked to the conference theme was a cluster of papers focussing on new learning theory and approaches (see papers by Wals and Uzzell & Rathzell). Wals argues that encouraging participation in learning is one of the key aspects of social learning, namely learning that takes place when divergent interests, norms, values and constructions of reality meet in an environment conducive to meaningful interaction. Both papers on this theme suggest a need for a transformative environmental education model which will enable new forms of democratic participation that aim not to answer given questions but to formulate new questions and redefine the problems. Through their various contributions, Ntsoane, Velarde *et al.* and Kisaka propose innovative approaches to education and learning through the recognition of Indigenous Knowledge practices, Scenarios and Visioning, and Project-based Learning respectively. Velarde *et al.*, for example, argues that scenarios are valuable for planning and decision-making in complex and uncertain circumstances and that they enable processes in which people can share their expectations and reach consensus about an ideal future, by critically reflecting on it.

Other papers considered research and its role in environment and sustainability education. Martin, for example, asks: "How do we reconcile diverse approaches to research, and encourage greater exchange between environmental educators and scholars in diverse cultural contexts?". As shown in the paper by Van Petegem *et al.*, research also provides the information needed by educators and practitioners to make informed decisions about their teaching. They describe how they undertook research with learners in three countries to determine if their beliefs about human-environment interactions differed. This provided information on their diverse learning contexts and enabled them to adapt their educational practices accordingly.

Environment and sustainability education requires understandings of both local and global environmental issues and cultures and many different approaches because of their nature and diversity. Both Kudryavtsev *et al.* and Joop de Kraker *et al.* propose using online communication either in the form of online blogs (Kudryavtsev *et al.*) or collaborative e-learning tools (de Kraker *et al.*), and both make a case for using technology for global communication and collaboration as it is widely available, inexpensive and powerful.

Online tools such as those mentioned above are only one example of new and innovative approaches

to environmental education, however. Johnston and Carter suggest transformative teaching tools for educators which include: ecological ethics; nature-bonding experiences in the early years; evolution-ecology-biodiversity-ecosystem services as a continuum; environmental history; and sustainable development learning in action. In a related paper, De Wet and Robertson expand on nature and wilderness experiences as an approach to foster more environmentally responsible behaviour amongst youth. In their respective papers, Stanger, Kneebone and Willison also offer educational tools such as environmental art and the use of botanical gardens in engaging children and youth in the natural environment and improving their eco-literacy. The final three papers in the Monograph by Krasny and Tidball, Kaschula, and Lukman and Glavic, remind us that environmental education, using this diversity of methods and approaches, also responds to a diversity of issues which include civic ecology, HIV/AIDS and university campus management (among others).

This diversity of contribution brings the Monograph to a close. In reflecting this diversity, the Monograph reflects the spirit and content of the WEEC 2007. The WEEC 2007 was indeed a rich mix of contributions and insights reflecting a richly textured, ever changing and emergent field.

1 Is a Decade of Teacher Education for Sustainable Development Essential for Survival?

Some observations on international initiatives in teacher education for the UNDESD

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The need for a Decade of Education for Sustainable Development

The impacts of human induced warming of the atmosphere caused by increasing concentrations of CO_2 in the atmosphere are now daily news events. We still inhabit a planet on which not all children are guaranteed basic primary education, in which over a million adults cannot read or sign their name and where half the world's population lives on less than US$2 per day (Shah, 2006). The tragedy is that many people do not realise that these variables of CO_2, education level and per capita income are positively correlated let alone causally related (Robinson & Shallcross, 2006). Rees (2003) contends that in the face of global warming and many other threats there is a 50% chance that humanity may not survive to the end of the 21st Century without experiencing a devastating reverse. Education can be seen as part of the problem of unsustainability because it spreads a 'culture of denial' that rejects the link between modernity and the problems that threaten humanity's and ecology's future. The denial is that consumerism threatens ecosystems, that there may be limits to technology's ability to address negative ecological trends and that modern societies can learn from traditional cosmologies: environmental literacy is not necessarily the preserve of those who are literate and numerate. It is also clear from over 30 years of environmental studies that the simple linear educational model that claims that if people are aware of problems they will act for their resolution does not work on a wide enough scale to affect societal change (Sterling, 2001). Thus, if education is to address sustainability, it has to be transformed rather than reformed!

Education for teaching has been given a prominent role in the United Nations Decade of Education for Sustainable Development (UNDESD, 2005-2014), the international strategy for education to play a part in seeking sustainable solutions to problems such as climate change, illiteracy and poverty. Arguably the most rapid educational transformation to more sustainable lifestyles will occur if the pre-service and in-service teaching programmes used to educate the world's 60 million teachers (including the higher education academics who teach teachers) are reoriented towards sustainability. This is the central aim of the UNESCO International Teacher Education Network's (2005c) *Guidelines and Recommendations for Reorienting Teacher Education to Address Sustainability.* Success during the UNDESD will require not only the establishment of the networks that the *Guidelines* extol between UN agencies, governments, scientific communities, teachers, NGOs, local communities and the media (UNESCO, 2003, p. 2) but purposeful commitment to sustainable outcomes from these networks.

There are several issues that need to be explored in relation to the *Guidelines* and their implementation, including *language and terminology, the myths relating to sustainability and sustainable development, the priorities for ESD,* and *the external challenges,* however space does not permit a full discussion of these issues (see Shallcross & Robinson, 2007 for a fuller discussion).

Language and terminology

What is clear in the UNESCO literature relating to the UNDESD and academic writing across the broad field is the plethora of terms used to describe approaches to education that seek to address sustainable development. However the *Guidelines* do make content, process and action recommendations about ESD in initial teacher education. The content should: be interdisciplinary and address local and global sustainability issues; discuss social equity; identify content related to sustainability in mandated school curricula; and create opportunities to explore personal values and attitudes towards sustainability. ESD should advocate pedagogical processes such as: higher-order thinking skills that support decision-making, involve participatory learning and stimulate questioning; create ways to incorporate participation and decision-making into teaching and encourage the critical thinking and decision-making that influence personal lifestyles. Teacher education institutions should also do their bit by: developing certified ESD courses that student teachers can incorporate into their search for employment; promoting graduates who are knowledgeable in ESD; and placing graduates who have completed courses in ESD in key positions to help influence and bring about change.

Myths related to sustainability and sustainable development

Perhaps the biggest myth that surrounds sustainable development and ESD is the quasi-altruistic notion that both are concerned with saving the planet. The Earth is not fragile, even though many of its ecosystems may be in the face of the current global onslaught of economic growth

on the natural environment. The current environmental crisis is the latest manifestation of a succession of catastrophes. The planet has survived and recovered from many previous natural disasters and there is no reason to assume that it cannot survive a future human-induced catastrophe (Clayton & Radcliffe, 1996). Through the planetary process of self-regulation, the Gaia Hypothesis (Lovelock, 1995), the biosphere has recovered as new species and ecosystems have evolved to survive in changed environmental circumstances. Sustainable development then is not an emergency call to save our planet; it is an SOS to act to save our species by saving our souls as Rees's (2003) earlier grim prediction indicates.

Priorities for ESD
The recognition of sustainable development as an SOS does not abrogate humans from taking ethical considerations about the survival of ecosystems and other humans more seriously. Does humanity have the right to contribute to global warming to the extent that most coral reefs and many tropical small islands states are likely to disappear by 2050 as sea temperatures rise beyond the ecological niche of coral polyps? The moral belief in the pre-eminence of human interests when it comes to making decisions about resource use has to be challenged by a transformative ESD. Many environmental philosophers consider this belief in human self-importance, which has been the most pervasive assumption in Western philosophy, as the most dangerous idea that thinking about sustainability and sustainable development has to address. There is a strong argument that sustainability requires an ecocentric ethic that sees value in all of nature and protects all life forms and the speciation processes that produce them. But this retraction of human self-importance, which is so deeply embedded that it is often regarded as a natural idea, implies an ethical transformation in the deepest recesses of our cultural thought that will not be achieved suddenly. Education has a clear role to play in this transformation and teachers have a particularly strategic role to play in the associated transformation of schools and the educational process (UNESCO, 2004).

ESD is an approach to education that prioritises the journey towards elusive and dynamic visions of sustainability. ESD is action-focused in its intention to influence the way schools and communities act in more sustainable ways. It is a whole school approach to education that promotes action competence by enhancing self-efficacy that faculties of education should model.

ESD within and outside of teacher education deals with well-being in all three realms of sustainability – environment, society and economy. In doing so, it promotes lifelong learning that is based on local needs, perceptions and conditions, but acknowledges that fulfilling local needs often has international effects and consequences. In these ways, ESD builds civil capacity for community-based decision-making, social tolerance, environmental stewardship, adaptable workforces and it improves quality of life.

External challenges
The challenges of the UNDESD for teacher education include: addressing institutional awareness, developing models of professional development for ESD (Ferreira, Ryan & Tilbury, 2007) prioritising sustainability in the educational community, reforming educational systems and structures and sustaining educational programmes for ESD. Some of the reasons these challenges arise are because official curricula rarely mandate sustainability and teacher certification guidelines rarely mention sustainability (Varga et al., 2007). There is also a lack of policy to support ESD, a lack of awareness of the importance of ESD; a lack of support from ministries of education and a lack of coordination of efforts between ministries of environment, education, health, agriculture and others.

Reorienting education is one of the four main thrusts of the Decade. "Knowing what others are doing around the world is a significant source of learning and innovation and frequently an encouragement and motivational force to persevere in the long-term" (UNESCO, 2005a, p. 11). ESD should not be imported from one geographic region to another and there is no notion of ESD as 'one size fits all' as it has to account for regional differences (UNESCO, 2005b, p.16). In order to support the reorientation of education for teaching, "best practices from one place must be adapted and modified to become locally relevant and culturally appropriate in another place" (UNESCO, 2005b, p. 16). Promoting policy transfer requires a strategy for sensitive policy translation into the new context that requires an internalisation and understanding of ESD (Phillips & Ochs, 2004).

Some observations on international initiatives in teacher education for the UNDESD
McKeown and Hopkins (2007) trace the links between the UNDESD and the rationale for the development of the International Network teacher education advisory group. They outline the process that led to the development of the *Guidelines* and the stimulus that the *Guidelines* aim to give to the broader reorientation of teacher education towards sustainability.

There are a variety of initiatives that have addressed the challenges of the UNDESD from a variety of local contexts. The first three we draw upon reflect 'Southern' contexts– the Caribbean (Down & Nurse, 2007), South Africa (Lotz-Sisitka, Lupele & Ogbuigwe, 2007) and India (Ravindranath, 2007). Lotz-Sisitka, Lupele & Ogbuigwe (2007) interpret the design of an innovations course focused on ESD for African university lecturers. They describe how the United Nations Environment Project (UNEP) responded to the shortage of formal professional development opportunities for university teachers. In doing so they raise an interesting issue – how do teacher educators who generally provide professional development for school teachers achieve their own professional development in ESD? The authors draw upon actor network theory as their main analytical tool to

explore the participatory networking processes involved in the design and dissemination of the *UNEP Innovations Course*. They develop an interesting postcolonial rationale for the involvement of 'Northern' experts in an Africa-focused curriculum development process.

Down and Nurse (2007) write about the development of a Caribbean Network for the reorientation of teacher education towards sustainability. This Network is particularly interesting as it is one of the few to involve members from both 'Northern' and 'Southern' countries. Their analysis seeks to examine the practical and intellectual challenges that arise from the process of contextualising ESD, which they see originating from a 'Northern' agenda. They discuss the importance of the in-between space as the interstitial forum which affords the opportunity for exploring, interrogating and developing situated approaches to ESD, which might as a consequence be less contaminated and more indigenised by revisiting and employing Manley's concept of non-alignment.

Ravindranath (2007) outlines and analyses the concerns which arise in trying to infuse ESD into pre-service and in-service teacher education programmes in a country which embraces 202.5 million school children, 5.5 million school teachers and one million schools. His paper reviews some exemplars of the efforts that different agencies have made to address this task. In doing so, Ravindranath (2007) examines an Indian focus on environmental education, which he locates within the history and traditions of Indian philosophies that promote oneness between the natural environment and the human environment. He concludes by drawing our attention to the possible stresses and contradictions between collectivist traditional Indian philosophies and individualism associated with the growing involvement of India in an increasingly globalised and flatter world.

Three other initiatives are located entirely or primarily in the 'Northern' world. The first paper by Alsop, Dippo and Zandvliet (2007) from Canada examine the application of critical place-based education to teacher education in ESD. Their first case study looks at a unit taught in Canada which has a strong action research focus located in a social ecology approach to sustainability. Their second case study draws on an action research approach to professional development in ESD that has a strong focus on emancipatory research and an empowerment approach to professional development in rural areas of Peru. In their paper they discuss the importance of emotional engagement with issues that are underpinned by notions of social and ecological justice and also illustrate the ways in which teacher education based in an audit culture becomes part of the educational problem as it desensitises people by disconnecting them from place and nature.

Ferreira, Ryan and Tilbury (2007) engage with a task that the *Guidelines* recommend but do not really address, that of outlining models of teacher professional development in ESD. They describe three different models for ESD based on initial teacher education projects from across the world. These models are the collaborative resource development and adaptation model, the action research model and the whole-of-system model. Their paper uses a systematic literature review framework to interrogate these examples. They conclude that in different ways each model is deficient in terms of mainstreaming ESD into initial teacher education and suggest that a systemic approach that engages the whole teacher education system through action research is necessary if ESD is to be successfully mainstreamed.

Varga and Koszó (Hungary), Mayer (Italy) and Sleurs (Belgium) (2007) address the attainment of teacher competences for ESD through reflection. In doing so, they describe and draw upon the Environment and Schools Initiatives (ENSI) and contrast the European Commission's and the United Nations Economic Commission for Europe's (UNECE) competences. Their analysis revolves around two case studies from the ENSI network – one focused on pre-service and one focused on in-service teacher education and both of which have an action research component. Varga et al. (2007) conclude that the school development ENSI approach to ESD is more congruent with process-oriented rather than product-oriented competence development. They identify tensions between competences based on the audit culture and outcomes and process-focused competences associated with situated models of teacher learning.

Conclusion

Many of the tensions within and between these initiatives have been addressed above, but there are common themes that appear. Almost all the initiatives endorse the contextualised model of learning that the UNDESD associates with the reorientation of teacher education in ESD. They all share a belief in the power of horizontal and vertical networks in ESD projects provided that these have a clear focus and the need for ESD to promote action and link with communities. There is a strong belief in the power and the role of action research with a focus on social and environmental justice in teacher education in ESD, particularly in the three 'Northern' initiatives. It is also interesting that none of the initiatives share a common analytical frame in their search for explanation and meaning that offers support for the contextualised model of learning. There is support for a whole-of-system approach to ESD in teacher education. Collectively, these initiatives provide some insights into how the reorientation of teacher education might work in different contexts.

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Local Realities, Global Responsibilities: Building a Culture of Responsibility
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Abstract
The driving force for sustainability is learning in all its forms. Globally, we have reached a stage of conscious evolution in which we recognise ourselves as co-creators of our collective future. As awareness and experience increase, people strengthen their capacity to make sustainability part of their everyday life. The development of a sustainable society can now be described as a continuous learning process engaging people as new opportunities arise. The interface between environment and education for sustainable development requires connecting diverse cultures and diverse knowledge systems to understand the implications of connecting what we learn to where we live.

Eco-effectiveness: A Framework
Connecting what we learn to where we live is an essential component to furthering the implementation of National Sustainable Development Plans of Action. How do we create the means to sustain our well being, ensuring healthy communities, economies, and ecosystems?

Until recently, sustainability has been defined in terms of a linear process, now it is conceptualised as 'a transition towards', consisting of many widely varied local and global events around issues of climate change, biodiversity, and poverty. With clear and compelling evidence, the scientific community is advising a strategy of adaptation during this century while working to mitigate the Twenty-second century (Board on Sustainable Development, 1999). Well-documented from the primary literature by Pimm, the life support system and the living systems that support the biosphere are stressed and in long-term decline with an accelerating rate of deterioration (Brown, 2001). The scale of change in Earth's systems is unparalleled in history, leaving scientists unable to predict the future or map a course of action based on the past (Pimm et al., 1995; Pimm & Raven, 2000). Conventional wisdom dictates that the laws of nature are not negotiable and setting a course for global sustainability is essential for the long-term survival of the planet.

International policy debates on the dynamics between environment, society and economics are growing in intensity, and in turn, as global systems impact local realities, a greater number of voices are demanding democratisation, clarification of what and whose rights, public participation, and access to knowledge and technology (Brosius, 1999; Jarboe, 2001). Indigenous peoples' voices are being heard on the international stage of policy-making asserting their rights as demonstrated by the formation of the "Indigenous Peoples' Plan of Implementation on Sustainable Development" for the next decade, based on the Kimberly Declaration adopted at the World Summit on Sustainable Development (WSSD) in 2002:

> We have the right to determine and establish priorities and strategies for our self-development and for the use of our lands, territories and other resources. We demand that international instruments be developed that would assure that free, prior and informed consent must be the principle of approving or rejecting any project or activity affecting our traditional lands, territories and other resources (Indigenous Peoples' Plan of Implementation on Sustainable Development, 2002).

The current phase we have entered can be described as not quite understanding how we will cope with both the increasing complexity and interrelatedness of issues where attempts to ameliorate one can alter or even exacerbate the impacts of another. Building a future based on interests that go beyond short-term success and self-interest is fundamental to sustainable systems. The interface between environment and education for sustainable development requires connecting between diverse cultures and diverse knowledge systems to understand the implications of environmental, social, economic and cultural decision-making within the local context (Puntenney, 1995). Three areas of strategic importance to moving beyond eco-efficiency, where we are still producing toxic materials, to eco-effectiveness, where we are able to protect the integrity and health of ecological and human systems, are: i) learning processes, ii) environmental stewardship, and iii) innovative solutions based on principles of sustainability (McDonough & Braungart, 2002; Ny et al., 2006).

The failure of globalisation to alleviate poverty, advance sustainability goals, avert financial crisis, or stem the tide of economic and environmental refugees, is creating the impetus for more integrated approaches to models of development, e.g. CARE and Oxfam's 'Rights-Based' approach to development (Arizpe, 1998, 2004). There is a call for a new international model of development (Annan, 2000). Given this present state of affairs, Arizpe (2004) points out that: "People cannot manage the natural environment rationally if the 'way we live together' forces us to be hungry, greedy or destructive." She then argues for a more in-depth multi-dimensional analysis in developing a conceptual framework and agenda for a 'cultural transition – a new model for human relationships where the focus is on developing the civil capacity to negotiate diversity as a complementary principle to sustainability'. We have reached a stage of conscious evolution in which we recognise ourselves as co-creators

of our collective future. At this juncture in the relationship between human actions and the ecosphere, the challenge is to maintain a 'unity of purpose' in building governance and a civil society. That said, there is still much to learn about how problem solving and relationship-building dialogues ought to be handled. As awareness and experience increase, people strengthen their capacity to make sustainable development part of their everyday life. The development of a sustainable society can now be described as a continuous learning process engaging people as new opportunities arise.

Linking Knowledge with Action
With the growing list of critical issues regarding ecosystem integrity and sustainable human systems, people are struggling at all levels within society to understand that sustainability and the protection of natural and human environments needs to be linked to scientific information and a knowledge base of backyard biodiversity in every country, particularly in developing and underdeveloped regions of the world (Jäger, 1997). Worldwide, every country is in a transition period where intellectual capital is a strategic resource necessary to achieving sustainable development.

The driving force for sustainability is learning in all its forms. At the centre is the environment (Rappaport, 1994). In principle, environment, learning and sustainable development are so familiar that people aren't aware of their strategic impact. Momentum to bring environment, education and sustainable development together at the international policy level emerged from these global initiatives: the 1972 Stockholm Conference on the Human Environment, the 1977 Intergovernmental Conference on Environmental Education, the UN World Summit on Sustainable Development, Agenda 21, the UN Millennium Development Goals, and other international commitments. In turn, they provided the backdrop to the current initiative, the UN Decade of Education for Sustainable Development 2005-2014. With environment, education, and sustainability so strategically placed, both a challenge and an opportunity present themselves: a challenge to engage people at all levels in sustainability within the framework of eco-effectiveness and an opportunity within the framework of a learning society to strengthen the implementation process of building a culture of responsibility based upon principles of sustainability (Puntenney, 1998a, 1998b, 2002a).

On one level, society is learning to be. On another level, professionals are not particularly good at channelling practice and innovative solutions. As a result, there is a strong need to understand where humankind is situated in terms of local realities and global responsibilities, especially in relationship to the biosphere. Indicators are needed that are based upon principles of sustainability that create informed political entities and an informed civil society that can act on those principles to improve overall well being. More importantly, strategic indicators are vital to further develop an understanding of how to create a learning society (Senge, 1990; Puntenney, 2003).

Understanding Dynamic Indicators of Success
Criticism is often leveled by the media regarding the lack of political will to act in terms of environmental/ecosystem protection, poverty eradication, water quality, or progress towards sustainable development. What is often overlooked is that the 1992 United Nations Conference on Environment and Development (UNCED) known as the Earth Summit or simply referred to as "Rio" was perhaps the most significant Environmental Education event of the 20th century.

Thousands of people came to Rio and returned home with a better sense of the global framework for sustainable development. Worldwide, thousands who couldn't attend Rio participated indirectly through such means as reports, meetings, post-Rio conferences, mass media, and informal networks. And in doing so, also gained an understanding of the framework needed to address issues of sustainability.

It is important to note that this community of educators included diplomats, delegates, members of the press and mass media, NGOs, community and religious leaders, professional educators, scientists and academics, politicians, representatives from business and industry, indigenous peoples, youth, women, and ordinary people. In the process leading up to Rio, during Rio, and post-Rio, people were educated, and returned home with an enhanced capacity to guide the learning of others to address the complex issues of building a sustainable future.

In this way the concept of environment and education was expanded at UNCED, shifting the language to include sustainability. Because hundreds of thousands of sustainable development initiatives are occurring worldwide, a broader vision of education as a process – integral to policy deliberations and implementation strategies – has become apparent. Within the policy making process, a vision of education began to emerge in the legal mandates that encompasses diverse stakeholders in a meaningful way in order to create an informed political forum and an informed public. And within that vision, the government delegations negotiate the interface between environment, economic and social agendas, positioning education as a cross-cutting issue. The 2004 Tsunami disaster in the Pacific in conjunction with the 2005 UN Commission on Sustainable Development (CSD) cluster of issues focused on water, sanitation/hygiene, and human settlements further integrated education into the national sustainable development strategies.

In 2002, ten years after the UN Conference on Environment and Development in Rio de Janeiro, Brazil, the World Summit on Sustainable Development in Johannesburg, South Africa was held to evaluate progress made by nation-states and to develop a plan of action (http://www. johannesburgsummit.org/4/20/07). Moving from just 'talk shops' to action, two paradigm shifts occurred on the world stage of multi-lateral decision-making. The first, ownership by putting people at the center of development, and the second, ensuring sustained impact by defining development in terms of demonstrated support and

complementary partnerships to intergovernmental commitments spelled out in the Johannesburg Plan of Action (Dodds, 2002; Puntenney, 2002b).

It is the focus on learning and learning systems that elude us amidst the power struggles and the consequences of our decisions, plans, programs and projects. We lack the necessary mechanisms to monitor and report on what is working, what is not, and how can we do this better. The world has never been in this position before so there are no roadmaps. We can no longer view knowledge in terms of product and dissemination. Using multi-dimensional analysis, it becomes very apparent that an additional challenge to environment and education is to bring to bear the cultural systems dimension addressing issues of access, equity, hope and security (Raven, 2002). In this regard, the work of Peter Brosius has been enlightening. Brosius has been building a theoretical model regarding transnational politics and conservation (Brosius, 1999). In bringing anthropological knowledge to bear on the United Nations Millennium Ecosystem Assessment he asks a series of 'what if?' questions that directly challenge professionals to think about how we do ethnographic research. Does the current concept of knowledge include questions that also seek information regarding stakeholders' analyses of the political world, trends, tradeoffs and response options?

Similar to the critical analysis of knowledge and knowledge systems conducted by Paulo Freire regarding theory and praxis (Freire, 1970, 1978), Brosius (1999) asks us to think about how professionals see stakeholders: are they reservoirs of local knowledge or political agents with their own ideas about the saliency and legitimacy of different forms of knowledge? And as we think about our own fieldwork, consultancies, and engagement with stakeholders, do we have the capacity to systematically incorporate the data into development implementation strategies and to make a more systematic effort to inform and influence alongside our other colleagues?

What is needed to work towards sustainability is an intelligent dialogue involving diverse stakeholders whose lives are directly impacted by the consequences (Puntenney, 2003). The next step will focus on building a global leadership network through the use of the latest web technology to provide direct input into the environmental policymaking process and local engagement. William B. Stapp (1969, 1978, 1979, 1982) through his leadership in developing Earth Day in 1970, later as UNESCO's first director of the International Environmental Education Programmes, and as chair of the UNEP-UNESCO sponsored 1977 Intergovernmental Conference on Environmental Education, defined environmental education as:

> [Education] to develop a citizenry that is aware of, and concerned about, the total environment, and its associated problems, and which has the knowledge, attitudes, motivations, commitment, and skills to work individually and collectively toward solutions of current problems and the prevention of new ones (Stapp, 1979, p. 35).

Conclusions

In principle, environment, education and sustainable development are so familiar that people aren't aware of its strategic impact on the process. This provides both a challenge and an opportunity: a challenge to raise education and sustainability higher on the agenda and an opportunity within the framework of inter-linkages to strengthen the dialogue. There is a stream of awareness regarding the importance to stakeholders with a huge amount of knowledge and information being driven by learning processes. That said, there is a sense that many of the most significant issues regarding education and sustainability are neither well recognised nor understood by government leaders and diverse stakeholders. Opportunities for innovation are overlooked.

Environmental education and education and sustainable development should be shifted toward and related to the sustainability agenda as originally conceived and reinvigorated in the preceeding global conferences (Stockholm 1972, Belgrade 1975, Tbilisi 1977, Thessoloniki 1987, UNCED 1992, Rio +5, Johannesburg 2002).

Many countries are in a transition period where intellectual capital is a strategic resource necessary for sustainable development and eco-effectiveness. For example, digital technologies have allowed us to transmit information quickly and widely, linking distant places and diverse areas of endeavor in productive new ways. The increasing demand for better coordination and effective implementation of sustainable development strategies is reshaping the relationship between human activities and environmental knowledge globally.

On the one hand, we are learning to be. On the other, we are not particularly good at channeling practice. Consequently, we need to understand where we are, especially in relationship to the biosphere. Indicators are needed that are based upon principles of sustainability that create informed political entities and an informed public that can act on those principles, improving our overall well-being. But in particular, strategic indicators that will help us monitor our progress towards sustainability, understanding how to create a learning society alongside learning organisations. Consequently, three areas of strategic importance to achieving sustainable systems are: 1) learning processes 2) environmental stewardship, and 3) innovative solutions based on principles of sustainability.

Dag Hammarskjöld (1905 – 1961), UN Secretary General, talks to us about his personal enquiry into his world, about cultural differences and development and about making a difference one step at a time. He prefigures a vision of our common future in his ambition to understand. Together with his colleagues and friends, he brought the message of peace alive through his determination, strength, courage and integrity, advising "Never measure the height of a mountain until you have reached the top. Then you will see how low it was."

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ESD in southern Africa:
Epistemological and pedagogical discourses

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Abstract

This paper is based on current Education for Sustainable Development (ESD) and United Nations Decade of Education for Sustainable Development (UNDESD) discourses in southern Africa. Data is mainly drawn from the Education for Sustainable Development discourses in Sub-Saharan Africa and UNESCO documents on Education for Sustainable Development. The paper highlights themes and topics that may be of interest and useful in contributing to the implementation of UNDESD. It covers social, economic, political and ecological issues from global to local contexts and considers their impact. The paper stimulates and invites debates on sustainability issues and their implication for teaching and learning to promote social transformation in the Decade.

Introduction

Recent initiatives on education for sustainable development in southern Africa were given impetus by the United Nation's Declaration of the Decade of Education for Sustainable Development. The UNDESD came at a time when debates were gaining momentum on what, how, why, where and who should/is to play an effective lead in partnership with UNESCO and other agencies. Debates around Education for Sustainable Development have centred around trying to understand the concept, its appropriateness, implications in different contexts and education policies. The debates on how to re-orientate education to incorporate ESD attempted to integrate different approaches to harmoniously mainstream ESD without causing any tension within existing curricula. This paper does not provide detailed background to the UNDESD but rather focuses on its implications as far as epistemological and pedagogical discourses are concerned in southern Africa. The analysis is based on the author's views in relation to ESD in the southern African region. It draws on base-line information on the status of ESD debates, and the practices and mechanisms needed for supporting this practice, concentrating on themes/topics that may be identified as most useful and suitable for teaching Education for Sustainable Development in the Southern African region. It also draws on the Sub-Saharan Strategy for Education for Sustainable Development and other initiatives in the southern African region.

United Nations Decade of Education for Sustainable Development

United Nations Decade of Education for Sustainable Development (UNDESD) came at a time when its identity and purpose were still being debated. The UN General Assembly Resolution 59/237 that declared the Decade encourages Governments to consider the inclusion of measures to implement the Decade in their respective education systems and strategies and, where appropriate, national development plans (UNESCO, 2005). The overall goal of the UNDESD is to integrate the principles, values and practices of sustainable development into all aspects of education and learning. It also invites governments to promote public awareness of and wider participation in the Decade through, *inter alia*, cooperation with and initiatives engaging civil society and other relevant stakeholders especially at the beginning of the Decade.

The UNDESD's main thrusts are improving access to quality basic education; re-orientating existing education programmes; developing public understanding and awareness; and providing training (UNESCO, 2002, p. 2). The Decade goals are related to the Millennium Development Goals (MDGs) and Education for All (EFA). The Millennium Development Goals' attention to the provision of primary education and gender equality in education overlap with the Education for All agenda (UNESCO, 2002). The Decade of Education for Sustainable Development also addresses pedagogical processes, the validation of knowledge and the functioning of education institutions. It also promotes a set of underlying values, relational processes and behavioural outcomes, which should characterise learning in a range of contexts. The dilemma arising through the emergence of Education for Sustainable Development as a dominant narrative may be traceable to the choice of emphasis on either environmental education or Education for Sustainable Development. This has resulted in slow-paced policy processes to address sustainability. Diverse contextual understandings of environmental education and Education for Sustainable Development are already shaping education policy discourses and influencing pedagogic practices in schools. Debates around environmental education and Education for Sustainable Development discourses continue to compound curriculum policy processes globally. What is perceived to be a choice between environmental education and Education for Sustainable Development may be further compounded by complexity, uncertainty, unstable and competing perceptions, and open-ended understandings of both environmental education and Education for Sustainable Development.

In southern Africa, like in most parts of the world, environmental education is undergoing some transition as it begins to emphasise sustainable development despite Education for Sustainable Development being contested by some intellectuals such as Jickling and Wals (2003) and Huckle (1991 & 1996). It is criticised for attempting to narrow environmental education as an open-ended process and for constituting 'development'

as the endpoint for educational discourse. Sustainability is perceived as shallow in theory, requiring further research and discussion in the context of environmental education. It appears there is a dire need for education policy development to direct and mediate between environmental education and Education for Sustainable Development. UNESCO (2002) argues that environmental education policy development should encompass or create space for education for sustainability across sectors and stretch beyond compartmentalised sectors and provide linkages, exchange and interaction among stakeholders in education. As acknowledged by UNESCO (2002), the root of Education for Sustainable Development is firmly planted in environmental education efforts and has striven towards achieving the goals and outcomes similar and comparable to those inherent in the concept of sustainability. Therefore, in incorporating sustainability in the education system, environmental education should not simply be viewed "as something of an 'historical artifact' informing … recent discourse on 'ESD'" (Lotz-Sisitka, 2004, p. 48), but should enable a more dynamic and reflexive discourse with contemporary validity and value.

The Sub-Saharan strategy on UNDESD
To translate UNDESD goals and objectives into workable measures, the sub-Saharan Africa Strategy for Education for Sustainable Development coined its strategic objectives as follows:

- To improve the harmonisation and commitment for the implementation of education for sustainable development at the regional and national level;
- To broaden public awareness on and to strengthen the practice of principles of sustainable development both in individual and collective lives;
- To promote an education system which enhances African cultures, especially in the dimensions that contribute to sustainable socio-economic development;
- To strengthen in all its dimensions the quality of education within the framework of sustainable development;
- To consolidate and diversify partners with a focus on education for sustainable development (UNESCO-BREDA, 2006).

To implement the decade into the education systems, we do not only require policy changes, strategies and plans, we also need a deeper understanding of what it is, what is required and what to implement or appropriate in particular contexts. This paper aims to provide insights into how southern Africa is tackling Education for Sustainable Development at the start of the UNDESD (Lotz-Sisitka, Olvitt, Gumede & Pesanayi, 2006a; UNESCO, 2005).

Themes and topics most useful and suitable for teaching ESD
Driving global environmental processes are powerful international discourses regarding environmental justice, environmental education, sustainable development, contested 'poverty-induced' environmental degradation, desertification, deforestation and non-governmental

organisations' efficacy (Moseley, 2004). Some of the key *global socio-ecological issues* that stimulated environmental awareness and influenced policy processes include: inadequate supply and availability of fresh water, rapid population growth, poverty and inequality, food shortage, depletion of tropical forests, loss of biodiversity, pollution, desertification and many more (Ketlhoilwe, 2007).

The outcome of the SADC-REEP ESD consultation process covering 600 participants in 14 countries indicated an interest in education and training initiatives that can help society re-orient towards poverty reduction/alleviation, food security, ecological sustainability and health. The key findings of the consultation process covered:

a) Inadequate debate on sustainable development
b) Partnerships and participation in the UNDESD
c) Education for sustainable development practice and quality and
d) Supporting education for sustainable development practice (Lotz-Sisitka et al., 2006a).

One of the key aspects of Education for Sustainable Development seems to be a need to foster and sustain an ongoing, open-ended, critical review of ways in which sustainable development is being interpreted, appropriated and applied in different social and environmental contexts (Lotz-Sisitka et al., 2006b). Education for Sustainable Development creates a new challenge to balance economist, environmentalist and social ideologies in knowledge-creation and for educational thinking and practice in southern Africa (ibid.). The content of educational programmes should be contextualised to take into account national and local realities and concerns. The consultation process indicated that they were responding to a diverse range of issues and challenges through the following broad areas:

i) *Environmental issues and risks.*
Environmental issues and risks are increasing in complexity in the southern Africa context and need multi-pronged approaches including socio-political will and space in the educational arena. These issues and risks include increased environmental degradation; over-exploitation of natural resources for short-term benefits; land degradation – leading to decline in productivity of the land and food insecurity; fresh water contamination; air pollution; solid and liquid waste management; special waste such as medical waste; drought; wildlife depletion, poaching and loss of biodiversity; deforestation; desertification; water wastage; inadequate sanitation and vulnerability to environmental change (e.g. floods, droughts, global warming). They also include coastal zone degradation and marine issues (degradation of the marine environment and marine resources); current approaches to energy provision (burning of fossil fuels, nuclear etc.); use of toxic products and inadequate management of toxic waste; loss of natural heritage; land use conflicts and uncontrolled urban development. These issues and challenges are not common to everyone and in every context. They also pose a threat to sustainable development efforts and

hence there is a need for collaborative efforts nationally, regionally and internationally.

ii) *Social issues, risks and challenges.* These include the HIV/AIDS pandemic, resulting in the deepening of poverty, lack of alternatives and a lack of participation in development initiatives. There are also social issues such as health risks such as malaria; malnutrition and health of children; gender inequality, discrimination and vulnerability of women and children to health risks and abuse; street children and orphans; industrial health issues and a decrease in general levels of wellness in the workplace. There are related challenges such as increased vulnerability; population growth and settlement patterns; social values and moral regeneration; the quality of education and the valuing of education in society; instability in the human resource-base due to the impact of HIV/AIDS, economic hardship and poverty. A focus on the implementation of Education for All and the Millennium Development Goals by southern African states may be one way of tackling some of the above social issues, risks and challenges and hence making a contribution to the implementation of UN DESD.

iii) *Economic challenges:* Socio-ecological issues, risks and challenges are accompanied by economic challenges such as poverty and a decrease in standards of living; high levels of unemployment; food insecurity; skewed distribution of land wealth, and land tenure systems still tied to traditional systems. There are also challenges such as time constraints and other constraints imposed by donors and funders; high costs of inputs and low selling prices for products; a growing consumer culture and related lifestyles particularly amongst the rich and the youth (i.e. new influences on youth culture).

Southern Africa also experiences challenges such as lack of integration between private sector initiatives and public planning processes; dominance of globalisation and neo-liberal economic approaches and structural adjustment policy impacts (e.g. job losses and unemployment). There is also a shortage of resources needed to provide adequate housing, facilities and capital for appropriate development. The region currently has inadequate access to resources for social services such as health and education. These issues may provide the bases for curriculum design to contribute to the Decade of Education for Sustainable Development.

iv) *Political challenges* are also prevalent in southern African states. Challenges include: corruption; poor governance; lack of political commitment; lack of synergy amongst government departments, policies and implementation strategies. Governments are responding to policies rather than to needs on the ground. There are gaps between policies, practices and needs (both social and environmental needs) on the ground. Other identifiable political challenges include short term objectives of politicians and failure to implement policies. Decentralisation of policy-making (linked to lack of synergy and lack of capacity for delivery and implementation); war

and lack of security are characteristic features in Africa and some states in southern Africa (Lotz-Sisitka, 2006). These issues, if left unchecked from the sources, would derail sustainability effects and make Education for Sustainable Development statements the usual 'official rhetoric'. They need to be addressed through a variety of avenues including immediate curriculum innovations at all levels as an investment for future peace and prosperity.

The Sub-Saharan Africa Strategy (2006) states that it is no longer necessary to add themes but to renew educational concepts and approaches by strengthening the meaning and substance given to education. Education for Sustainable Development should be designed basically as the means to develop critical thinking that induces a change of attitudes and behaviours among children, the youth and adults in schools and communities. One of the major challenges of Education for Sustainable Development is to approach the training of educators/trainers with a view to bringing about a profound change in the ways of thinking, attitudes and behaviours for sustainable development (Sub-Saharan Strategy, 2006).

Regional foci when teaching education for sustainable development
Existing initiatives in the field of Education for Sustainable Development, encompassing environment related areas, include: Family Life Education, Population Education, and Health Education.

Teaching of Education for Sustainable Development should go beyond acquisition and transmission of knowledge, individual development, socialisation and economic development to include concrete action towards:
- Poverty reduction
- Peace and social and political stability
- Gender equality and equity
- Health promotion
- Environment sustainability
- Culture in relation to skills, behaviours and values to be promoted
- The enforcement of the principles of good governance and transparent management (UNESCO-BREDA, 2006).

These may form a basis for curriculum reform and policy to make a meaningful contribution to the UNDESD. Identified strategies to enhance Education for Sustainable Development implementation include partnerships, participation and networking. These inclusive frameworks involve participation of formal schooling, universities and colleges, public awareness and community development (Lotz-Sisitka et al., 2006b). Given the current global human and environmental concerns, learning institutions such as colleges and universities have significant potential to affect changes in sustainable development processes. These changes could be affected through:
- Research which promotes critical and innovative thinking and development of best practices;
- Application of a variety of pedagogic approaches such as problem-oriented and project-based learning, and

utilisation of information;
- Access to interdisciplinary and intercultural human resources meaning that universities are able to forge agreements and implement projects across borders and cultures and thereby open development routes not otherwise accessible.

In order to maximise their role as important agents in Education for Sustainable Development, institutions of higher learning could:
- develop human resources capable of integrating social and economic equity, environment and development through democratic and participative processes;
- develop lifelong learning skills based on problem and project-oriented approaches;
- ensure gender equity in their programmes and activities;
- promote the use of information and communication technology in the generation, acquisition and dissemination of knowledge;
- ensure that indigenous and contemporary knowledge systems are brought into the learning and research processes;
- facilitate equitable socio-economic development through close collaboration with civil society as well as the public and private sector in order to support economic, environmental and technological development and serve as role model in sustainable resources management and ethos.

In order to succeed in this endeavour, institutions may benefit from systematic and coherent cooperation as well as networking for achieving lasting relevance by making significant and meaningful contributions towards achieving sustainable development.

To ensure Education for Sustainable Development practice and quality, the following were identified as strategies deployed by the 14 SADC member states:
- Involving people in sustainable development actions to meaningfully reduce poverty and improve the quality of life of the people – through participatory approaches and methods, seeking integrated solutions and critically evaluating the appropriateness of environmental and sustainability education practices;
- Participatory, active and learner-centred methodologies;
- Dealing with complex issues;
- Working with values, ethics and cultural diversity;
- Creative and critical thinking;
- Working with indigenous and local knowledge;
- Ensuring inclusivity in Education for Sustainable Development practice (Lotz-Sisitka et al., 2006b)

To support Education for Sustainable Development practice, it is important to provide adequate institutional and policy support. Equally important is good evaluation and monitoring strategies. Education for sustainable development will need to be mainstreamed in curricula,

learning support materials will need to be developed, and policies reviewed, developed and used. Focus will also need to be on advocacy and vision-building; institutional capacity-building; fundraising, financial managment and project design and management; professional development and training; curriculum development work; leadership; Information and Communication Technology (ICT) and research (Lotz-Sisitka et al., 2006a).

In many southern Africa countries, environmental non-governmental organisations are working in partnership with governments to achieve sustainability. This partnership to promote sustainability is indicative of change in how power patterns operate. Sharing of responsibility and accountability may go a long way in achieving the global call to engage communities in social practices including policy formulation and implementation. Of interest to this paper is how these relations shape policy discourses.

The focus of the next section is on curriculum-related activities as they define the focus for teaching and implementation of education for sustainable development in southern Africa. The section focuses on the appropriateness and content of approaches. The following excerpt was extracted from the Zambian consultative workshop conducted in early 2006:

> Curriculum should not be static, but dynamically moving to integrate global experiences and also emerging societal issues related to poverty alleviation. There is also a need to integrate issues that affect the majority of people in the region (poverty alleviation) if learning is to be meaningful to the community. Curriculum must meet the needs of the people and the community (Lotz-Sisitka et al., 2006b).

Most of the southern African states are engaged in a variety of initiatives to integrate and infuse emerging issues such as environmental, human rights, gender, HIV/AIDS into the mainstream curriculum. Environment and sustainability issues are cross-cutting, and require multi-disciplinary responses.

The challenge is how these issues and strategies should be incorporated into existing curriculum models and frameworks. Various strategies had been suggested. They include the following:
- *Infusion approaches* – which involve infusing these issues into existing curriculum frameworks. This strategy had being adopted by Botswana in its Revised National Policy on Education (Botswana Government, 1994).
- *Integrated approaches* – which involves cross-curricular strategies such as project work and local investigations, where knowledge and skills from various subjects are all used to address the same issue/set of issues.
- *Re-orientation* - of subjects to include emergent issues (including ESD) as integral to the subjects. This

involves restructuring subject content and outcomes to incorporate emerging social issues so that these become a key dimension of what is learned in the subject. This implies that emerging issues are valued in the same way as any other content and skills in the subjects, and that they are integrated into assessment systems and are also dealt with in textbooks and other mainstream curriculum processes (Lotz-Sisitka, 2006).

Power relations in global discourses
Powerful organisations and institutions such as IUCN, UNESCO, WWF, etc. drive the events leading to the introduction of Education for Sustainable Development into education systems around the world. They have formed coalitions to encourage countries to address the increasing global socio-ecological problems that are transcending national boundaries. They base their campaigns on new socio-ecological knowledge that is scientifically-based and proven, expert led, and holds financial and social power. They use their implicit power through the media and exercise more power through partnerships with the United Nations, international agreements and conventions. They set agendas regarding epistemologies and pedagogical discourses and countries are subjected to reactive situations within both local and global contexts. Countries react by developing educational policies in line with global thinking and contexts, rendering the power of global coalitions effective, as shown by the social movement to incorporate education (environmental) policy in the southern African context.

Summary and Conclusions
The southern Africa states are currently making efforts to define their role and activities to make a contribution to the UNDESD. They are responding differently in different contexts. New efforts are linked to existing educational policies – and the global, national, regional and local contexts. Education for Sustainable Development has come at a time when countries were grappling with environmental education discourses. The UN Decade of Education for Sustainable Development should be perceived as bringing new knowledge and opportunities that extend and strengthen environmental education. With this understanding, concentration of subject/curriculum content should cover issues that are a threat to the sustainability of human life, the environment and the economy/development. The contents should strengthen political, social, economic and bio-physical environments. Teaching of these issues should not be compartmentalised to the extent that learners associate them only with academic subjects but rather a multi-model approach should be practised. For instance, southern African states have identified infusion, integration and re-orientation approaches. These should be practised across different contexts to affect social change that would not only benefit humanity but also the natural environment and its natural resources.

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Compromises and democratic responsibility in ESD
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Abstract
The purpose of this paper is to discuss how ESD can prepare coming generations for dealing with value-related compromises. This question is examined against the background of three different traditions of environmental education – fact-based, normative and pluralistic – in Swedish schools. These traditions comprise three different ways of relating to the democratic responsibility inherent in public education. The pluralistic approach is suggested as being best suited to the development of ESD practice. The pluralistic approach is qualified at the end of this paper with the aid of a pragmatic philosophical perspective.

Introduction

The most recent report of the Intergovernmental Panel on Climate Change (IPCC) states that there is a 90% certainty that global warming is caused by human activity (see www.ipcc.ch). This report predicts that, at best, global temperatures will probably rise by 1° C in the next hundred years (if greenhouse gas emissions are maintained at their present levels), and in a worst scenario, by 6,4° C. As a consequence it is likely that temperature extremes will become more frequent, the sea level will rise by an average of 50 cm, and hurricanes and typhoons will increase in both number and strength. These scientific conclusions naturally make climate change an issue of utmost concern in efforts to create a sustainable future.

But sustainable development is not only about facts. To some extent the activities of the current generation have always affected the environment and the conditions for future generations. We are thus forced into making compromises between present desires and coming needs. The question is which compromises we would regard as both reasonable and morally acceptable. It would be difficult to imagine that anyone would be opposed to a sustainable future, but sustainability issues often contain conflicts between different values, ideologies, priorities and strategies that cannot be resolved by simply referring to scientific investigations. This means that although there might be agreement on certain facts, judgements of these facts and ways of valuing, the consequences of different measures may differ as a result of personal and contextual aspects.

One of the main challenges thus facing education for sustainable development (ESD) is how we prepare coming generations to deal with value-related compromises. When facing this challenge in public education, the specific demands put on educational practice in terms of democratic responsibility are of essential concern. The purpose of this paper is to discuss this issue in relation to three different traditions of environmental education in Swedish schools that comprise three different ways

of relating to the democratic responsibility of public education. The empirical basis for the identification of the teaching traditions is a national evaluation of environmental and sustainable education in Swedish schools (Swedish National Agency of Education, 2001). It is suggested that one of the traditions, a pluralistic approach, is most suited to the development of ESD practice in public education. Towards the end of the paper, this pluralistic approach is qualified with the aid of a pragmatic philosophical perspective.

Different Traditions of Environmental Education

Traditionally, value-related questions similar to those associated with sustainable development have been included in environmental education (EE). It therefore seems reasonable to suggest that the progress of the practice of ESD should build on and develop these valuable experiences of EE.[1] In earlier studies (The Swedish National Agency of Education, 2001; Öhman, 2004; see also Sandell et al., 2005) I have suggested that the variety of ways of teaching about environmental and developmental issues can be viewed as different *selective traditions*.[2] The selective traditions represent different answers as to what constitutes good teaching in a subject, include different practices with regards to the selection and organisation of the subject matter, and consists of a selection of different forms and teaching methods. In the studies referred to, three different selective traditions within environmental education were identified in Swedish schools: a *fact-based* tradition, a *normative* tradition and a *pluralistic* tradition. The question is, to what extent are these different traditions appropriate both as a starting point for the progress of ESD, and for the creation of an approach to the ethical and moral aspects of sustainable development that takes the democratic responsibility of education into account?

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[1] This doesn't mean that ESD can be approached simply as an extension of EE. As many authors have pointed out, sustainable development is a complex term and many ambiguities and tensions exist within this notion, which also have consequences for ESD (see Bonnet, 1999 and Stables, 2001). My point here is that educational practices are continuous, and that the development of a practice can be seen as a process where prior experiences, habits and customs are involved and transformed.

[2] The term 'selective tradition' was originally developed by Williams (1973) to underline that a certain approach towards knowledge and a certain educational praxis are always selected within the frame of a specific culture. The identification of selective traditions of environmental education are a result of historical textual analyses of textbooks and syllabuses in science education (Östman, 1995, 1999), which in the Swedish national evaluation of EE and ESD (The Swedish National Agency of Education, 2001) was complemented with new analyses of different authoritative texts on environmental education.

In the *fact-based* tradition, teachers primarily treat environmental issues as knowledge problems. This tradition is based on the idea that environmental problems can be dealt with by means of more research and information supplied to the public. The position taken is that only science can provide a reliable foundation for our knowledge about environmental issues and that scientific facts and models have sole importance in an educational context. The democratic role of education is to provide objective facts as a basis for the students' opinion-making. The democratic process is therefore something that comes *after* education. An objection that can be raised against the fact-based tradition as a basis for ESD is that the value dimension of sustainable development is omitted from the teaching agenda. The resulting action competence[3] is therefore rather poor, as the students do not gain any experience of participation in democratic discussions or how to transform their standpoints into action.

The formation of the *normative* tradition can be viewed as an answer to the fact-based tradition's shortcomings concerning value-related content. In this tradition, the important task of education is seen as supporting an environmentally friendly transformation of society. The answers to value-related issues are established through deliberative discussions among experts and politicians on the basis of scientific facts about the current ecological state of the world and are presented in policy documents and syllabuses. The democratic process is thus something that comes *before* education. This also implies that it is possible to derive values from facts and come up with universal solutions to environmental and developmental problems. Schools are then obliged to teach students the necessary environmentally friendly values and attitudes and, in this way, attempt to change the students' behaviour in the desired direction.

There are, however, objections to a normative approach as a basis for the formation of a future ESD. When specific values and behaviour are seen as being more sustainable than others, and are promoted in education, there is a risk of turning education into a political tool to create a specific predetermined society. This means that there is a danger that education will lose its emancipatory potential and its democratic obligation will be violated; the result being that education then resembles indoctrination (see the warnings of Wals & Jickling, 2000 and Jickling, 2003). The scope for compromise is thus decreased and possibilities for finding acceptable ways of dealing with sustainable issues are diminished.

Accordingly, many authors have claimed that the democratic mission of an education that involves diverse interest groups, supports free opinion-making and enhances students' competence to act should be a significant feature of future EE and ESD programmes (see Jensen & Schnack, 1997; Elliott, 1999; Wals & Jickling, 2000; Lijmbach et al., 2002; Stables & Scott, 2002). To a

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[3] See Jensen & Schnack (1997).

great extent, such claims are in line with the *pluralistic* tradition of EE found in Swedish schools.

The *pluralistic* tradition is characterised by a striving to promote different perspectives, views and values when dealing with various questions and problems concerning the future of our world. Reaching compromises in value-related sustainable issues, or recognising and accepting our different standpoints, is seen as being accomplished by deliberative discussions. Such discussions are an essential part of education in the pluralistic tradition, and the democratic process is accordingly situated *in* education itself. One could say that an aim of pluralistic education is to enhance the student's competence to act in a conscious way and to participate in debates, discussions, decisions and compromises in these issues at a private everyday level as well as at a comprehensive societal level.

When one compares the traditions in terms of their ways of preparing students for dealing with sustainable compromises, the pluralistic approach appears to have a number of advantages. For example, it takes the democratic role of public education into account and recognises the value dimension of sustainable development. At the same time, it strives to avoid the risks of indoctrination by promoting students' critical thinking and their competence to act.

The pluralistic approach is not without its problems, however. A common objection is that when no firmly based and specific sustainable values are pointed out in educational practice, it could be interpreted as though all alternative actions are equally right and all values equally good. And if everything is equally good and right, i.e. 'anything goes', how might a commitment to important issues be encouraged? In the final section of this paper I propose a pragmatic philosophical understanding of the pluralist approach as a way of dealing with the relativism problem and deepening the democratic implications of this approach.

Table 1. Summarising the features of EE traditions concerning fact-value relation, relation to the democratic process, and possible objections.

EE-tradition	Fact-Value relation	Democratic process	Objections
Fact-based	Is	After	Omitting the value dimension
Normative	Is → Ought	Before	Indoctrination
Pluralistic	Is ↕ ↔ ↕ Ought	In	Relativism

ESD as a Communicative Practice and Democratic Arena

Pragmatic philosophy, as represented by fathers like William James, George Herbert Mead, John Dewey and current representatives like Richard Rorty, can be seen as an attempt to create an alternative to the traditional epistemological dualism between inner mind and outer reality. Instead of merely occupying themselves with metaphysical considerations about the relation between our beliefs and our environment, pragmatists focus on the different human *practices* where human beings communicate their attitudes and opinions about the true and the false, the right and the good, etc., in everyday life.

Thus, when one uses a pragmatic perspective to address the possible relativism problem of a pluralistic approach the question is not whether there are foundations for our beliefs or not, but rather whether the 'anything-goes' problem is one where people participate in pluralistic practices. It is a common observation that opinions vary between different human beings in such practices, and also that human beings change their opinions. It is, however, also the case that when people live through a specific situation, "one cannot find anybody who says that two incompatible opinions on an important topic are equally good" (Rorty 1982/2003, p. 166). In practice, the question of whether a belief is philosophically grounded is generally not something we really give much thought to, although we *do* care about "the various concrete advantages and disadvantages it has" (Rorty 1982/2003, p. 168). Thus, from a practical point of view the question of relativism is rarely a problem.

This practical and communicative focus also relates the pluralistic approach to the democratic conception of education as developed in the pragmatic tradition. In his influential work, *Democracy and Education,* Dewey (1916/1980) clarifies the relationship between democracy and education by pointing to communication as the carrying connection between the two. The view that Dewey took was on the one hand that "democracy was not primarily a mode of management and control, but more an expression of a society imprinted by mutual communication, and consequently a pluralist life-form" (Englund, 2006, p. 508). On the other hand, he understood education as a forum where people can communicate different experiences and accordingly continuously reconstruct their experiences through common meaning-making processes. In this perspective, the ideal of democracy is not a situation where people relate to each other by declaring and defending their preconceived standpoints, but rather a situation where people create new possibilities by influencing each other. In this way, Dewey underlined that education "represents not only a development of children and youth but also of the future society of which they will become the constituents" (Dewey, 1916/1980, p. 85).

A practical educational consequence of this understanding of democracy, as a form of life and as an attitude, is that learning democracy means to learn by participating *in* different kinds of situations of democratic communication where diverse experiences, opinions, arguments and views are openly exchanged (rather than learning *about* the rules of a certain predetermined procedure that prepares students for future democratic actions and discussions). In order to create such learning situations it is required that young people are recognised as social and moral agents and are received as already democratic citizens. That is, that citizenship is not seen as something that is acquired by young people through acting in any particular way, but as a *practice* that everyone in the society is involved in from cradle to grave (Lawy & Biesta, 2006). Thus, a pluralistic approach is an approach that opposes conformism and, moreover, that views the practice, values and attitudes of democratic citizenship as constantly changing rather than permanent.

If it is to be at all meaningful to young people, it is also essential that the democratic dialogue takes its departure in the experiences of young people, the issues that they find significant and that relate to the particular social and cultural milieu of their day-to-day lives. It is a well known fact that the differences between the milieus of different people are rapidly increasing in contemporary society. However, difference is also the very condition for communication and it is by experiencing difference that we can learn something new. The meaning of communication "is therefore neither the transmission of an objective world, nor the exchange of subjective worlds. It is the creative co-construction of an *intersubjective* world" (Säfström & Biesta, 2001, p. 67).

The challenge for both democracy and education is accordingly not to create unity and consensus, but rather to make plurality and diversity possible in a shared, local and global community. Difference can even be seen as the quality that distinguishes education from indoctrination (Säfström and Biesta, 2001). Striving for sameness and conformity would not only exclude those who do not fit the standards of normality, but would also reduce the number of possible compromises in questions about sustainable development.

This understanding of democracy and education has important implications for the overall reception of ESD. First, it amounts to making ESD an education in democracy, where school is viewed as one of the arenas in society where value judgements concerning our common future can be displayed, deliberated on, exchanged and sometimes agreed upon in open democratic discussions. Secondly, it means that the values of sustainable development are made the subject of constant discussion, where ideas pertaining to sustainability and the compromises we have to make are continuously reconsidered, rather than a promotion of a preconceived idea of what constitutes a sustainable society. Instead of being a fixed goal, sustainable development then appears as a compass needle pointing the way to future development. In this way we might apply a similar attitude to sustainable development as Dewey's to democracy: "The very idea of democracy, the meaning of democracy, must be continually explored afresh; it has to be constantly discovered, and rediscovered, remade and reorganized" (Dewey, 1937/1987, p. 182).

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Working with environmental ethics and adult education: Some experiments and reflections from southern Africa

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Abstract

This paper proposes that, within environmental education and education for sustainable development processes, we should be paying more attention to environmental ethics. However, in recognising the centrality of ethics, questions are raised around educational approaches and appropriate pedagogy. These questions are situated within a globalised world characterised by social disequilibrium and environmental risk, with a particular focus on the southern African context of development and socio-ecological justice. Drawing on philosophical perspectives, educational and social theory and the author's experiences of adult education and training, a case is made for creative, pragmatic and open-ended approaches to environmental ethics. Finally, tentative questions are posed around the nature and role of ethics in deliberative learning processes that stimulate and support reflexivity.

Ethics-based environmentalism

Environmentalism, as a new social movement, speaks into the face of unprecedented ecological and human calamity and recognises that conceptions of environment cannot be disentangled from social reality and people-environment relationships. According to Jacobs (1997, p. 11), these complex inter-relationships between socio-political, economic, historical, ecological and technological spheres of human existence on the planet are value-laden too:

> Environmental issues are not simply about the physical facts of damage and loss. They are vehicles which carry into the political arena the deeper anxieties and questions which many people feel about the direction and values of modern societies.

Environmental issues and risks raise fundamental ethical questions about what we value, our place in nature, and the kind of world we aspire to leave for future generations. However, whilst the environmental movement is thus understood to be strongly ethics-based, there is little consensus regarding the ethical positions it claims to advance (Singer, 1993; Weston, 1994; Hattingh, 1999, 2002; Des Jardins, 2006).

Hattingh (2002, p. 5), for example, describes the concept of sustainable development as part of a moral imperative, in the same genre as democracy, justice, fairness and equity that "...apparently no one can ignore or reject without having very good reasons for dissent". The difficulty associated with this is that there is very little consensus on what exactly 'sustainable development' means, and so,

as a moral agenda, each interpretation offers ideologically different starting points. Hattingh (2002, p. 14-15) reveals how different interpretations of sustainable development provide "ideologically loaded answers to fundamental value questions" such as:

> What is so important that we should strive to maintain it forever? Is it expansion of material growth; consumption; survival; needs satisfaction; quality of life; the flourishing of life on earth; or the ecological basis of life in general?

> With a view to whom or what should we pursue the sustainability of this valuable something? Do we do it for the sake of nature, or the sake of people; do we do it for the sake of the rich or that of the poor; or for the sake of the whole of the community of life?

The challenge lies in navigating these philosophical waters and asking 'what is right?'. Bauman (1993), in his commentary on the postmodern condition, suggests that we are unable to adequately answer the question 'what is right?' because we live in a world of floating responsibility and ambivalence in which the previously trusted and constant authorities of morality are no longer adequate:

> The scale of consequences our actions may have dwarfs such moral imagination as we may possess. It also renders impotent the few, but tested and trustworthy ethical rules we have inherited from the past and are taught to obey.... Even if we abide by such rules scrupulously, even if everyone around observes them as well, we are far from certain that disastrous consequences will be avoided. Our ethical tools – the code of moral behaviour, the assembly of the rules of thumb we follow – have not been, simply, made to the measure of our present powers (Bauman, 1993 p. 18).

Bauman (1993) also refers to the contingency of ethics: that our ethical codes are uncertain, fluid and 'until-further-notice'. Deciding what is good and right becomes increasingly uncertain as circumstances continually shift and are redefined. Moral responsibility may prove to be the only lingering beacon, although itself characterised by uncertainty and self-interrogation. Bauman (undated, p.30) observes that we require a new ethics "made to the measure of the enormous distances of space and time on which we can act and on which we act even when we neither know nor intend it".

It is necessary to acknowledge the educational implications of this: that we cannot really teach for the future by limiting ourselves to the metaphors, discourses, priorities and knowledge bases of the present. And seeking to find the right answer may prove futile and unnecessary anyway because "the future is open … Everything could be worse than we think, or better, but it will almost certainly be different than we think. All we can do is act on our best guesses and our hopes" (Weston, 1994, p. 176). Bauman (2001, p. 139) lays out the challenge for education: to theorise "a *formative* process which is not guided from the start by the target form designed in advance … an *open-ended process*, concerned more with remaining open-ended than with any specific product and fearing all premature closure more than it shuns the prospect of staying forever inconclusive (my emphasis)".

Working at the interface of environmental ethics and education

Environmental values, attitudes and ethical frameworks have been on the international environmental education agenda for over 30 years. The 1972 Club of Rome Report identified the urgent need for "a basic change of values and goals at individual, national and world levels". Similarly, the Brundtland Report of 1987 called for "changes in human attitudes" and a "vast campaign of education, debate and public opinion". Whilst the discourse of these international documents reflects a clear recognition of the links between values, socio-ecological justice, lifestyle choices and sustainable futures, little is offered in terms of how such inter-relationships might play out in educational practice.

Hattingh (1999) calls for more 'spaces' (in the form of practices, structures, institutions and so on) to explore the diversity of environmental ethics and allow new perspectives to be fostered and to flourish. In keeping with this, Jickling, Lotz-Sisitka, O'Donoghue & Ogbuigwe (2005, p. 2-3) describe ethics as "a process of enquiry and critical thinking", and they are careful to emphasise that ethics is not about preaching, indoctrinating or inducting learners into a particular code of behaviour. They go on to add: "Seeking out assumptions, examining them, and making thoughtful decisions about how they affect our actions is the work of ethics".

Jickling & Wals (2003, p. 5) draw attention to the inadequacies of transmissive approaches to education, which seek compliance and social reproduction. They argue that education viewed instead within an emergent and more transactional, transformative paradigm is more likely to enable citizens to be active participants in the ongoing decision-making processes of their communities and to "become critically aware of how they perceive the world with a view to fostering moral action". Wals (2007) later draws more explicitly on social learning theory to examine the intention(s) and form(s) of learning processes when conceptualising sustainability challenges. He suggests that:

The nature of sustainability-challenges seems to

be such that a routine problem-solving approach falls short as transitions towards a more sustainable world require more than attempts to reduce the world around us into manageable and solve-able problems. Instead, such transitions require a more systemic and reflexive way of thinking and acting with the realization that our world is one of continuous change and ever-present uncertainty (Wals, 2007, p. 1).

And he asks, "How can people become more sensitive to alternative ways of knowing, valuing and doing, and learn from them? How do we create spaces or environments that are conducive to this kind of learning?" (Wals, 2007, p. 3). Wals concludes, in an appropriately open-ended way, that "reflexively stumbling towards sustainability" depends on democratic and emancipatory learning processes that allow for unrehearsed dialogue. This means that consensus cannot be forced on people, and that the dialogue, diversity, antagonisms and dissonance arising from such social learning processes may be "radically indeterminate".

Similar methodological insights have emerged from two decades of environmental education practice in southern Africa. Like Wals, O'Donoghue (personal communication, August, 2006) recognises learning as an open-ended process, and suggests that our struggles to "reason our way towards making reasonable lifestyle choices" emerge through the indeterminate interplay of:

- our own socio-cultural settings, prior experiences and knowledge (*situating stories*);
- direct encounters that may perhaps give us a sense of connection or a realisation that 'this matters to me' (*proximity experiences*);
- opportunities to ask questions and share ideas through taking practical actions (*practical reasoning and enquiry*).

Together, these interactions create rich opportunities for deliberation i.e working through and working out what needs to be done (*re-imagining*).

A review of the work of Jickling (1999), Hattingh (1999), Jickling & Wals (2003), Wals (2007), and O'Donoghue (2006) reveals several commonalities. All recognise the centrality of values and attitudes in the learning process, and the need for practical and creative engagement with them. And all suggest that the learning processes associated with that should be open-ended, non-deterministic and humble. In the following section I consider these and other perspectives in relation to my experiences with various groups of adult students from around southern Africa as they engaged with ethics-oriented concerns during professional development courses offered by Rhodes University, South Africa.

Reflections on own experiences as educator-researcher

Environmental education processes, like the environmental movement as a whole, are recognised as being 'values-

laden', implying an ethic of caring for the planet and recognising and acting upon areas where responsible human decision-making is required. However, my observations and experiences over the past seven years in environmental education (as a writer and tutor of professional development courses in environmental education in southern Africa) suggest that the values associated with practice are oftentimes taken-for-granted, under-examined or even contradictory. Course curricula, themselves values-based and conceptually laden, introduce adult learners to new discourses which may be taken up superficially or iconically, sometimes at odds with the deeply embedded history, culture and practices of the learner, and with the less deeply embedded but equally influential history, culture and practices of their workplaces.

Some early concerns centred around what I perceived at the time to be performative contradictions in the field of environmental education: adult learners verbalising support for certain values, ideologies or ethical perspectives (often those put forward in the discourse of course curricula), but 'failing' to recognise the inherent tensions or contradictions in their own professional practice or lifestyles. One such influential incident was in 2001 at the annual EEASA Conference, held that year in Lesotho. I joined a conference excursion to visit a local waterfall. After a lengthy bus ride we reached the destination at lunchtime and were given lunchpacks heavily packaged in polystyrene and cling wrap. Walking towards the rear of a long trail of approximately 50 environmental educators heading for the waterfall, I was dismayed to observe the dozens of empty cans and polystyrene boxes discarded along the pathway by members of our group. Generally, when one asks educators to identify an environmental problem to which they do or would like to respond, littering is one of the most common responses. As such, I could not reconcile this contradictory behaviour.

Initially this troubled me from what I currently recognise as an instrumentalist and behaviourist perspective. I had falsely assumed there to be a commonly understood and accepted set of values and principles that would inform ethical action in response to awareness of environmental concerns. Hence, assuming such ethics to be 'in place', I could not understand why so few environmental education practitioners were 'failing' to 'live out' the ideas which their course curricula (and indeed the overall discourse of the environmental movement) had so carefully articulated.

These questions re-emerged on another course after my observations of tensions between several course participants and a vegetarian tutor around the ethics of meat consumption. I noticed how the process of deliberating towards a reasoned/reasonable outcome was influenced by power gradients and senses of either violation or overprotection of socio-cultural norms. The tutor's 'position' came to be perceived by some as an

'imposition', and some learners defensively took on the discourse of cultural rights and intolerance. This motivated me to probe further the educational implications of this kind of interaction. During two other short courses over the next year, I experimented with a 'meat-eating quandary' activity to observe more closely the dimensions of values-laden encounters such as the one described above. Subsequently, I have worked on these and similar courses to explore other ethical quandaries and practical lifestyle choices (such as the elephant culling debate and ethical consumerism). These informal, practice-based investigations have helped me to explore questions about the diversity of environmental values and ethics that learners bring into course deliberations, and the kinds of pedagogical practices that appear to enhance or stifle learners' and tutors' engagement with such perspectives. The following section shares some of these emerging insights and reflects on them from various philosophical and theoretical perspectives.

Emerging insights on course-based ethical deliberations

Insight 1: Contextually and culturally-embedded environmental ethics
People-nature relationships, environmental values and ethics are strongly embedded in family life, traditions, cultural identity, cultural practices and religion. The following two extracts from a written exercise with environmental educators on the Rhodes/SADC Course in 2006, and the Rhodes/SANBI Course in 2007, reflect perspectives that are grounded in a strong sense of family, past experience and cultural identity:

Example 1. Growing up in the rural village of Limpopo these are some of the things I learnt from my grandparents: (i) my relationship with nature is spiritual – African religion – I respect it because it was made for me, therefore it is taboo to spoil it. (ii) All this biodiversity has unknown guardians in the mountains, hills, river, springs, has someone who is looking after them. When I visit or want to use any of these things, I kneel and request for permission. (iii) Trees and herbs are for my medicinal use, when I'm sick I consult with my traditional healers, they also consult with the spirit world which herb or medicine to use, I talk to the plants I request I can use them for my healing, I pick up the bottom part because the upper must still grow for future use. (iv) I also pay tribute to animals – especially the big and strong like the elephant, buffalo. I classify myself with them, I study their behaviour, characteristics. I do not kill them. I also call myself a buffalo or elephant, I imitate their movement, in time of dance I incorporate their movement in a dance.

Example 2. [The] prolonged drought I experienced in my childhood where I had to carry 25 litre bucket of water and 5-10 litres in hands from the spring and had to walk for up to 10km one way. On the way I hated being pushed around by herdboys who proposed love to us. This experience forced me to modify habits in handling and use of water.

It has also been interesting to note that, in such written tasks, people-nature relationships are seldom explained in terms of the individual position, but in terms of community and cultural reference points. However, more spontaneous discussions such as those that erupt in response to contentious or personal issues, often reflect a more individual and pragmatic approach and are especially dominated by financial considerations.

In learning processes, people's starting points for engaging with ethical questions are different, but appear to be predominantly influenced by socio-cultural capital and reference points of lived experience. This has been previously noted by Hattingh (1999) who, in arguing for an environmental pragmatist approach, states that lived environmental problems are always situated in a particular context, and that context is then linked with wider contexts within which it is embedded, such as cultural or historical contexts. This leads Hattingh (1999, p. 80) to suggest that, in considering how people engage with ethical concerns, "theory only plays a secondary role: providing tools in order to conceptualise problems and formulate proposals about addressing them".

Popkewitz (1991) emphasises the importance of bringing the past into contact with the present in order to understand better the patterns and ruptures of our social conditions. Learning, therefore, can be understood as arising from/existing within a context of complex socio-historical relations that include institutional practices and "historically formed patterns of power relations" (ibid. p.15). What Popkewitz describes as the intertwining of social, cultural, economic and religious strands, is further described by Janse van Rensburg (2002) as a web of relational dynamics that shape and constrain practices. Epistemology is hence recognised as being socially shaped, and a '*social* epistemology' begins to inform practice and, by implication, ethics.

Insight 2: Predominance of instrumentalist valuing of the natural world
The intimate relationship between people and the natural world appears to be widely recognised. However, examples cited are generally confined to domestic concerns and reflect a fairly basic – and sometimes erroneous – understanding of ecological principles, and usually in relation to their value to human well-being. The following extracts from on-course written tasks with teachers provide some indication of this:

Example 1. Children are aware even at school to keep their community places clean so as to get fresh air from the plants that we grow.

Example 2. Elephants and rhinos help to uplift our economy e.g. ivory, skin and tasks (sic). We also sell them to other countries to get money. Rats feed our cats and some birds which are useful to us. Dogs help us in security. Snakes, owls and others help to control the balance of

nature. Wolves, flies and vultures help in cleaning our environment by eating dead animals. Some plants and animals are used in worshipping our ancestors.

Callicot (1994, cited in Workineh Kelbessa 2002), controversially stated that:

> Africa looms as a big blank spot on the world map of indigenous environmental ethics for a very good reason. African thought orbits, seemingly, around human interests. Hence, one might expect to distil from it no more than a weak and indirect environmental ethic, similar to the type of ecologically enlightened utilitarianism, focussed on long-range human welfare.

However, Workineh Kelbessa (2005), drawing on his anthropological work with the Oromo of Ethiopia, suggests that, whilst African environmental ethics is strongly utilitarian, this does not deny spiritual and moral bonds with the natural environment. Whilst the Oromo protect their environment for direct human benefit, their practical experience (such as planting and harvesting crops and trees) has given them a profound sense of connection to "cycles of nature, the coming of the rainy season, the movement of the stars, solar cycles, the movement and the cries of birds, the nature of entrails, the behaviour of domestic and wild animals and the condition of trees" (Workineh Kelbessa, 2005, p. 21-22).

It should be noted, however, that very little has been written on environmental ethics in African culture in the absence of a systematically articulated environmental ethic. Workineh Kelbessa (2002) reviewed the *Journal of Environmental Ethics* from 1979 to 1999, and found only one article about Africa. He further emphasises that ethicists should note that African worldviews are far from homogenous across the continent (Workineh Kelbessa, 2005) and it may be problematic to use regional or culture-specific insights to illuminate the environmental ethics of others.

In a southern African context where patterns of globalisation, industrialisation and urban migration are changing people's relationship with the natural environment in significant ways, I am reluctant to draw solely on long-established western-oriented philosophical writings and/or isolated regional case studies of African worldviews to understand the ethical complexity and quandaries of environmental education students' practice. Future contextualised, empirical research may help to advance this area.

Insight 3: A changing world and shifting ethics
Interactions with a range of adult learners on several environmental education courses reflect Bauman's observation that "…human reality is messy and ambiguous – and so moral decisions, unlike abstract ethical principles, are ambivalent" (1993, p. 32). Bauman refers to the

contingency of ethics: that our ethical codes are uncertain, fluid and 'until-further-notice'. Deciding what is good and right becomes increasingly uncertain as circumstances continually shift and are redefined. Similarly, Soudien (2004) suggests that certainty has been replaced by uncertainty and the speed of change is accelerating constantly. Moral authority is no longer clear and values and traditions are in flux.

A simple values-clarification activity that I have used with slight modifications on three courses has demonstrated that ethical positioning is less certain than it may initially seem. Students were asked to stand along a line, the extreme left representing the response "No, I would not change at all" and the extreme right representing "Yes, I would change immediately". I then asked students a question: "If you discovered that something you do everyday was environmentally destructive, would you change?" and the group has a few seconds to contemplate their response and position themselves along the spectrum. Invariably, people spread themselves along the whole spectrum but with the majority clustered towards the right hand side. However, many students were reluctant to position themselves until I gave them a specific scenario. "Why do you need a scenario?" I argued. "Surely, if something is right in one situation, it will be right in another?" But my observations and lived experience suggest that this is not the case. People position and re-position themselves variously along the spectrum according to the conditions of each scenario. Determining factors (elicited from discussions during other on-course activities too) appear to be: financial considerations, time frames (e.g. are consequences immediately felt or delayed), social conformity, value attached to the subject, and lack of alternatives.

Insight 4: Equilibrium and disequilibrium
Disequilibrium (through debate, exposure to new ideas, disruption of 'comfort zones') can stimulate rich learning. However, some kind of equilibrium needs to be restored before students can go forward with their learning. Through various course-based activities and conversations, I have noted a fine balance between rich learning that arises from discontinuities, and learning hindered by too much uncertainty, personal anxiety or critique.

In discussing the ethical implications of meat-eating in southern Africa, one course participant stated that his 'eyes had been opened' by the facts and new perspectives about the ecological consequences of commercial meat production, but that the course had not supported him with practical alternatives (for example ideas on vegetarian cooking, and health considerations). This, he suggested, would limit his action, despite his interest in the subject.

On the same topic of meat-eating, other course participants reacted to the new perspectives by adopting a rebellious or resistant stance, refusing to outwardly engage with perspectives contrary to their own. Within the social dynamics of a course, these tensions manifested themselves variously through *humor* (making a joke of the debate so that any serious engagement is disarmed), *withdrawal* (disengaging from group discussions), *exaggerated positioning* (taking up a position during group discussions that is stronger or less nuanced than the one actually held), and *subversive campaigning* (expressing resentment and contestation only in informal settings, whilst taking up a neutral position during class activities).

Tools in support of practical action and the provision of trustworthy information are recognised as key contributors to learning through incidents of contestation. Without a reliable source of information to anchor group deliberations, such as course readings or empirical evidence, disequilibrium has proven difficult to settle. Similarly, without the suggestion of practical responses – or even just the process of visioning future possibilities – course participants found it difficult to move beyond their disequilibrium.

Conclusion
This paper has drawn attention to the ambivalent and often contested nature of the values that underpin the environmental movement and it has considered what this might imply for environmental learning processes. While international conventions and policies over several decades have highlighted the need for new ways of living, and the need to pay more attention to values and goals, there has been less certainty regarding the role of education and, importantly, possible orientations and methods of such educational processes. Recent work from a diverse range of international environmental educators is pointing to the importance of reflexive, open-ended, humble and creative deliberative approaches to learning in the context of environment and sustainability concerns.

From experiences of working with southern African environmental educators on professional development courses offered through Rhodes University, the paper has shared tentative insights into learning processes around ethics-oriented ethical deliberations. These are: (i) that engagement with environmental ethics concerns are contextually and culturally embedded; (ii) that instrumentalist valuing of the natural world predominates; (iii) that ethical deliberations take place in a changing world of shifting or ambivalent ethical reference points; and (iv) that effective learning seems to be stimulated through disequilibrium but subsequent ethical action is supported by information, visioning and tools to support the establishment of a new equilibrium.

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3

Energising Environmental Education: Creating a Statewide Network of Energy Educators

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Abstract
KEEP is a statewide education programme designed to develop, implement and evaluate energy education efforts in Wisconsin. According to the U.S. Environmental Protection Agency, 85% of pollution comes from the production, consumption, and disposal of energy and its byproducts. Schools spend a huge portion of their budgets on energy, second only to the cost of personnel. Energy education needs to be emphasised more strongly within environmental education initiatives. This paper will share how KEEP has used stakeholder partnerships to develop and sustain an energy education professional development network. Highlights include resource design, course implementation and programme evaluation.

Introduction to KEEP

KEEP, whose goal is to promote energy education in Wisconsin, was started in 1995 by the Wisconsin Center for Environmental Education, located within the University of Wisconsin – Stevens Point's College of Natural Resources. Through its resources and services, KEEP has served thousands of K-12 teachers throughout Wisconsin, including over 3,000 participants in its university-credited graduate courses. These teachers continue to interact with KEEP and each other to expand and improve energy education in Wisconsin schools.

School systems and utilities have come to recognise KEEP as an effective mechanism for implementing energy education projects. Achieving this success was accomplished in part by building productive partnerships among various state agencies and private organisations to support energy education in Wisconsin.

KEEP is funded by the state public benefits programme, Focus on Energy, and administered through the Wisconsin Center for Environmental Education (WCEE). Established in 1990, the WCEE works to improve environmental education in Wisconsin. The WCEE assists in the development, dissemination, implementation, and evaluation of environmental education programmes focusing on elementary and secondary school teachers and students. Focus on Energy, a statewide public benefits program, works with eligible Wisconsin residents and businesses to install cost-effective energy efficiency and renewable energy projects. In addition to funding from Focus on Energy and the WCEE, KEEP receives support from municipalities and utilities. These agencies provide scholarships that help reduce tuition costs, making energy education more affordable and attainable for teachers in their service territories.

KEEP focuses on teacher empowerment. The staff and course instructors work together to provide a proactive programme that supports teacher efforts to integrate energy education into their curriculum. The success of KEEP from both the private and public standpoints reflects well on the various organisations that have invested in energy education, communicating their support of developing energy literacy among teachers and their students.

Keep History – an Overview

In 1993, the Wisconsin Center for Environmental Education (WCEE) proposed that a statewide energy education programme be developed and implemented. In 1995, the Energy Center of Wisconsin (ECW), a nonprofit energy efficiency research organisation based in Madison, agreed to fund this three-year project. The Wisconsin Environmental Education Board and the University of Wisconsin–Stevens Point also provided support. With this initial funding secured, WCEE hired a coordinator of curriculum development, a coordinator of research, and a programme assistant in the summer of 1995, and the Wisconsin K-12 Energy Education Program (KEEP) was born.

KEEP began with a three phase project plan. These phases included developing a conceptual guide and activity guide for K-12 energy education (Phase I), developing and implementing an energy education inservice course for teachers (Phase II), and to continue these initiatives beyond the initial three-year funding period (Phase III). Phases I and II resulted in a conceptual guide that identified key concepts in energy literacy. Lessons within the activity guide were designed to address the concepts. These concepts and the corresponding activities are organised in the following themes:

Theme I: We Need Energy

Goal: To help students appreciate the nature of energy, providing them with an awareness of how energy is used to maintain, organise, and change systems that affect their everyday lives. Through participating in activities in this theme, students gain a fundamental knowledge about energy including what it is, where it comes from, what forms it takes, energy conversions, and limitations of energy use.

Theme II: Developing Energy Resources

Goal: To help students appreciate how they and other humans have become more and more dependent on the development and use of energy resources to satisfy their standard of living. Understanding what energy is and how

it flows through systems is necessary to appreciate how humans have come to value and treat energy resources.

Theme III: Effects of Energy Resource Development
Goal: To encourage students to investigate how energy use has affected their lives. Recognising these effects increases students' awareness of why and how they use energy and promotes an understanding of why energy resource use should be managed.

Theme IV: Managing Energy Resource Use
Goal: To help students identify ways they can help ensure that energy resources will be available for future users. For students to willingly and effectively take action to manage energy resource use, they must have a thorough understanding and appreciation of what energy is, how it flows through systems, its value as a resource, and the effects its use has on human societies and the environment.

By 1998, KEEP had successfully accomplished the goals of the first two phases, including the training of 20 Adjunct Faculty who offered the KEEP inservice course throughout the state. These Adjunct Faculty helped KEEP reach 600 teachers by the end of the initial funding period.

With the success of its first three years, KEEP entered the third phase of its development. Phase III is essentially the evolution of KEEP from a short-term *project* into a long-term *programme*. Projects in environmental education can have successful and impressive results; however, without sustained funding and staff involvement, their outcomes are short-lived. Within a programme, dedicated staff will continue to provide the time and resources to ensure that the achievements will grow and progress over time.

To help KEEP evolve into a program, the Energy Center of Wisconsin decided to provide the Wisconsin Center for Environmental Education with additional funding to support KEEP for two more years. For each year, KEEP contracted with ECW to conduct energy education projects that met needs of K-12 educators and created a statewide network of energy educators. There was a transition of KEEP staffing during this time. Staff involved in the first two phases moved on to other programmes, while the coordinator of curriculum development was retained to direct the programme. The WCEE hired a programme specialist and graduate student to assist the programme director to conduct the projects funded through ECW.

In 2000, the ECW worked with KEEP staff to ensure long-term financial support through Wisconsin's public benefits programme, Focus on Energy. This action further guaranteed KEEP's achievement of its third phase.

With the transition to long-term funding, the Wisconsin Center for Environmental Education guided KEEP through a series of statewide focus groups to direct future programme design. KEEP Adjunct Faculty conducted 14 focus groups involving over 100 teachers. During the sessions, the teachers answered the following question: What programmes, projects, and/or resources should KEEP develop to make energy education effective and fun? KEEP staff collected their responses and organised them into the following categories which have been used to direct KEEP programming since the year 2000:

Professional Development
Offer courses and increase the variety and format of the inservice opportunities, including courses online and special topics such as renewable energy or energy efficiency.

Resources
Design or secure resources and support materials to teach about energy, including a statewide listing of field trips and guest speakers related to energy topics. Schools need funding sources to secure these resources.

Networking and Outreach
Provide teachers with updates on energy education issues and opportunities. Offer networking forums for teachers to share ideas and experiences.

Student Involvement
Develop and offer a variety of activities involving students and the community in energy education activities, including contests and annual events.

Programmatic highlights
Since 2001, the Wisconsin Center for Environmental Education has been subcontracted through Focus on Energy to administer KEEP. These entities work together to develop, implement and evaluate projects that address the programme areas listed above. Following are highlights of how KEEP has addressed each programme area:

Professional Development
The following one-credit courses are available to K-12 teachers through KEEP:
- Introduction to Energy Education;
- Do able Renewables: Introduction to renewable energy education;
- Energy Education: Concepts and Practices (Online);
- School Building Energy Efficiency Education;
- Online Renewable Energy Education Course.

Resources
KEEP provides support materials that motivate students and makes learning even more fun, including activity guides, an education trunk, and demonstration tools (watt meters, light bulb hand crank generators, and Pedal Power®, a bicycle-powered display board that demonstrates the concept of energy efficiency through active audience participation).

Networking and Outreach
KEEP provides teachers with a semi-annual newsletter and monthly online bulletin which include useful updates about

energy issues in education and society. Each year, KEEP hosts an Educator Tent at the world's largest Renewable Energy and Sustainable Living Fair. The KEEP Website, www. uwsp.edu/keep is a resource for materials, networking, and interactive information on energy education.

Student Involvement
KEEP offers teachers three programmes to energise their students' energy learning experiences:

• Bright Idea Fundraiser: student organisations sell ENERGY STAR® qualified compact fluorescent light bulbs while promoting energy awareness;
• Annual Bookmark Contest: students are invited to submit artwork to illustrate an energy theme. Winning artwork is published on KEEP bookmarks that are distributed throughout the state;
• Student-Built Homes Support Program: KEEP encourages technology education classes to design and build energy efficient homes.

These projects enable KEEP to work towards its goal of increasing and improving education while simultaneously helping Focus on Energy achieve its goal to encourage energy efficiency and use of renewable energy, enhance the environment and ensure the future supply of energy for Wisconsin. As the diversity and number of projects KEEP was contracted to conduct increased, it followed that the KEEP staff needed to increase as well. Therefore, KEEP hired an outreach specialist, a renewable energy specialist, a project coordinator and a programme assistant.

Being part of the state's public benefits program has enriched and enhanced the development of KEEP. Unfortunately, this program has suffered serious budget cuts over the past few years and KEEP, along with other Focus on Energy programs, has been affected. Therefore, KEEP currently employs a full time staff of four plus a half time programme assistant. The staff includes the program director, a programme specialist, a resource specialist, and an outreach specialist. Despite these budget cuts, KEEP staff continue to develop and offer stellar programs to Wisconsin teachers.

To continue at its current level of performance and especially to further evolve into a proactive energy education programme, KEEP will require a dependable, consistent source of funding. Teachers need KEEP to be a reliable, consistent programme they know they can turn to for help with their energy education efforts. Over the past ten years, school systems, utilities, and cooperatives have come to recognise KEEP as an effective resource for implementing energy education projects. KEEP needs secure funding to have the time and stability to further build and develop school-community partnerships. With secure base funding, KEEP will continue to employ staff who possess the expertise and resourcefulness to design effective and innovative programs that will help institutionalise energy education in Wisconsin K-12 schools.

Project and Program Evaluations
The director of the Wisconsin Center for Environmental Education, Randy Champeau, often states that KEEP is one of the most heavily evaluated education programmes in existence. Many of the evaluations were completed internally to direct project development and revisions. The *KEEP Activity Guide* in particular went through extensive formative assessments and has undergone several external reviews. Teacher evaluations of the publications and the inservice courses are especially valuable; their reviews provide KEEP with insights used to continually improve its products and services.

In 2000, the Energy Center of Wisconsin contracted with Primen, an information company that provides in-depth research and consulting services for companies involved in the retail energy industry, to conduct an independent evaluation of the Wisconsin K-12 Energy Education Program. Their assessments included surveys and interviews with KEEP stakeholders (Adjunct Faculty and programme sponsors) and with hundreds of teachers who have participated in KEEP courses since 1997. KEEP received the evaluation results in 2002 and the findings have been used to improve programme outreach and marketing. In general, the Primen evaluation noted that KEEP teachers outdo non-KEEP teachers in several metrics including frequency and time of student exposure to energy concepts, teacher perception of student learning, attitudes, and energy use, and teachers' self-reported preparedness to teach about energy.

What's Next for KEEP?
The future of Wisconsin depends on energy literate individuals who possess the knowledge, skills and attitudes that will allow them to use energy resources wisely. Energy education must be an integral part of the school curriculum to produce energy literate citizens. As KEEP moves forward, it must continue to support teacher efforts to integrate energy education effectively. This requires:

• Ongoing inservices for teachers who have not previously participated in KEEP;
• Support structures for graduates of KEEP inservices.

To date KEEP has reached thousands of Wisconsin teachers, including over 3,000 who have participated in its university-credited inservice courses. About one-fifth of Wisconsin's teachers have heard of KEEP. With future outreach and programme activities, KEEP seeks to increase this percentage of teachers informed about energy education. ECW's external evaluation of KEEP found evidence that many other influential players such as school district curriculum coordinators know little or nothing about the program. Given energy's role in the state's academic standards as well as its critical role in the state's future, the number of teachers reached and district support of energy education must increase. KEEP will continue to offer inservices around the state and it will work with the state's teacher education programs to ensure that new teachers are exposed to energy education before they enter the classroom.

In the end, though, these initial materials and associated inservices are not sufficient to guarantee ongoing energy education. KEEP graduates need ongoing support. Some graduates want additional opportunities to network with other energy educators. Many need help building school-community partnerships on energy issues. Some graduates have indicated they would like to integrate more extensive and in-depth energy practices in their school districts. These teachers have the potential to become leaders in their districts, provided KEEP can support their efforts.

KEEP builds statewide capacity by providing opportunities for teachers to become energy education leaders in their community. KEEP will play an instrumental role in teacher networking and supporting school-community partnerships. Integral to these partnerships is the involvement of local energy professionals and KEEP can serve as the conduit between teachers and these professionals.

KEEP is effective in part because it is the product of collaboration between a variety of actively-engaged partners. When KEEP was initiated, WCEE brought expertise in developing and fielding educational initiatives. The Energy Center of Wisconsin and its members brought expertise on energy issues and a variety of perspectives on those issues. The addition of Focus on Energy to this team enabled KEEP to evolve into a statewide capacity-building programme for energy education. The collaboration among these stakeholders created an effective programme that deals fairly with complicated and often controversial issues. Moreover, this collaboration supports the integration of energy education into school curriculum and helps to develop energy literacy in Wisconsin schools. KEEP will continue to work with these partners and will seek out new team members to further evolve KEEP's capacity-building abilities.

Undergraduates as change agents: Innovative environmental/sustainability modules at UWC

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Abstract

Environmental Awareness: Techniques and Training (EAT), an innovative and successful elective crosscutting environmental course, developed and taught on an inter-faculty basis (involving five faculties), allows undergraduates at the University of the Western Cape (UWC) to gain invaluable experience whilst they learn. Students remain specialists in their main programmes (e.g. chemistry or geography) and gain a solid grounding in environmental and sustainability issues and practices via EAT, developing the knowledge, skills and experience necessary for environmental practitioners and for everyday life. Integrated community engagement components are both educational and empowering and form the foundations for extensive sustainability implementation plans within the region.

Introduction

The Environmental Awareness: Techniques and Training (EAT) suite of elective environmental modules has been developed and implemented since 2002 at the University of the Western Cape (UWC), near Cape Town, South Africa. Its aims are to conscientise and empower students from many different social and academic backgrounds on the necessity for people to engage in environmental sustainability issues with a focus on the needs of a country in continued transformation. Integral to EAT are a number of opportunities for the undergraduate students to be actively involved in community engagement projects, activities that put classroom material into context and promote considerable professional and spiritual growth.

University of the Western Cape and regional context

The University of the Western Cape (UWC) was established in 1959 as an apartheid college for 'coloured' students. It is located in Bellville, 20 km north of Cape Town and has around 14 000 students, including a large number of international students including many from other parts of Africa. Over 20% of the student body are postgraduates. UWC's role in the liberation struggle has defined its distinctive academic role in helping build an equitable and dynamic society. Its students are mostly coloured or black and largely from low-income families in the local communities (including the townships comprised largely of people resettled from other parts of South Africa). UWC is a major tool for black economic empowerment (BEE) in South Africa. UWC's political history, geographical location, forward thinking and comprehensive academic coverage make it an excellent institution to promote multidisciplinary teaching and research and UWC's past, current and future role in the development of South Africa cannot be overstated.

Environmental Awareness: Techniques and Training (EAT) at UWC

Introduction to EAT

EAT is comprised of a number of elective environmental sustainability modules. Virtually all students have elected to read EAT and most staff are involved on a voluntary basis – these facts produce a dynamic, focused and engaged learning environment. Further enhancing this is the fact that students are drawn from different programmes and different faculties and the synergies of this are evident in the vibrant atmosphere present in the classroom. All EAT modules are 100% continuously assessed and the approach adopted in lectures is to engage students and encourage active participation from day one. One of the major attributes of EAT is that it allows students to remain specialists in their chosen fields (e.g. chemistry, geography, etc.) but also gain a meaningful knowledge of and practical approach to problems in the environment. EAT is presented by the most wide-ranging group of academics of any project at UWC, allowing students to build up an extensive environmental vocabulary. Its dynamic and engaged presentation style also helps students overcome the 'spoon feeding' approach to education that was entrenched at many high schools.

EAT Development

EAT was originally supported by the Southern African Consortium of Universities for Development and Environment (SACUDE), a project sponsored by DANIDA/DANCED (i.e. the Danish Government). EAT was inspired by a gathering of UWC academics at a SACUDE workshop. A UWC workshop, WSSD perspectives and the training of environmental practitioners in South Africa (October 2002) was followed by the appointment of an EAT Coordinator who has driven the project since January 2003. Since 2004 the EAT Coordinator has been funded by the Deans of four UWC faculties. All other staff have participated on a voluntary basis.

EAT was originally intended to be a new environmental science/studies degree programme drawing on the expertise at UWC. However, it was realised that this would merely reinvent the wheel, falling into the traps of either being too general (i.e. contributions from too many disciplines) or too focused (i.e. too closely attached to one department). Instead it was decided to develop a series of elective modules that would complement the existing programmes at UWC allowing students to remain specialists in their chosen discipline(s) but also gain valuable environmental training.

Key design criteria adopted for EAT included:

- Available to all – an elective for as many different programmes as possible;
- Accessible to all academically (i.e. no knowledge base assumed);
- Balanced coverage of international and local issues;
- Complement existing UWC structures;
- Designed from the bottom up to suit the needs of students;
- Based around interesting environmental issues with a stimulating presentation style including innovative assessment methods;
- Elective, not compulsory, modules.

Numerous problems were encountered during EAT's development including timetabling and differently sized modules in different faculties (i.e. inter-faculty issues) and 'turf wars'. The first two problems were dealt with by adopting the best compromise and the last by adopting an inclusive approach to EAT – all stakeholders who wished to contribute were encouraged to do so. Another problem was that the academic structure at UWC is organised firstly in programmes, then departments, then faculties – it took a long time to dispel the myth that EAT was just a Chemistry Department or Science Faculty and not an inter-faculty initiative.

EAT structure and content
EAT continues to be developed. It currently has the following three phases:
(i) Awareness (1/4 of a student's first year): Two modules address environmental issues from first principles (e.g. what is the environment, how environmental issues arise, etc.) through to complex global problems. Local, regional and international case studies are discussed from several perspectives giving students a balanced picture.
(ii) Training (1/6 of second year): This covers skills essential for environmental practitioners via the modules Techniques in Environmental Monitoring and Environmental Policy, Management and Decision Making.
(iii) Implementation (1/6 of third year). Takes the knowledge from year one and the skills from year two and applies them to real-life issues. The year-long module, Environmental Project Design and Implementation, covers the key theory and practice via lectures and tutorials and by students developing and running their own projects.

It is hoped that the second and third year components will be expanded to 1/3 of the student's credits. This will allow more opportunity for practical skills development (year two) and a more extensive individual project (year three).

Teaching and Assessment
Over 25 staff representing five UWC faculties and 12 departments present EAT. All are highly motivated and currently contribute on a voluntary basis. First year modules are split into topics, each of which has a designated coordinator, all being experts within that field. Each topic is presented by a number of academics

from different disciplines. Lectures and tutorials form the major means of communication but most of these are de-formalised with discussions, case studies, etc., being the norm. As mentioned above, all modules are 100% continuously assessed and each topic has an individual assignment ranging from formal tests, through applied exercises, to group presentations and projects. A large, overarching assignment (e.g. producing an information booklet for non-EAT students) is attached to each of the modules in years one and two, reinforcing the interconnectedness of the different topics and disciplines. The EAT Coordinator has a number of roles within the taught component such as providing continuity, promoting discussion and being the focal point for academic enquiries should the topic coordinator not be available.

EAT is currently available to first year students from the faculties of Arts, Science, Law and Education, with the vast majority being sourced almost equally from Science and Arts. At second and third year, students are currently restricted to the Arts and Science faculties, with more Arts students than Science. From 2008, BCom and BAdmin students from the Faculty of Economics and Management Sciences will be able to read a combined first/second year EAT programme in their second year.

Successes of EAT Programme
EAT year one was launched in 2004 and attracted around 45 students. This number has grown to around 100. Current second and third year registration numbers are around 30 and 15 respectively.

Student reaction to EAT has been largely positive. Most modules, topics and assessments have been rated very highly by students from all faculties. Pass rates have been 65-75% for first year modules, in keeping with the Science Faculty average, and therefore the continuous assessment format seems appropriate. Pass rates in the Arts and Science faculties have been quite similar, indicating that the material has been presented in a manner suitable for all. One of the best endorsements for EAT is that the students have formed the society EATSOC to facilitate extra curricular activities (see below).

Failings of the EAT Programme
Two major problems still face EAT. The first is the problem with timetabling clashes which is largely beyond the control of those involved with EAT. This leads to students missing class which makes it difficult to implement assessments that involve group presentations, etc. The second problem is that most staff still contribute to EAT on a voluntary basis. This is not sustainable and long-term and solutions are being sought including the potential founding of a new institute (see below).

Undergraduates as Change Agents: Community engagement via EAT
A number of opportunities have arisen from the EAT project to facilitate community engagement. Some of these opportunities were built into the academic structure

of the modules and some have arisen as a result of raised student awareness of environmental and sustainability issues. In general, students have acted as ambassadors for EAT and for issues of environmental sustainability. EAT students are enlightened, aware, and carry genuine emotional responsibility for seeing that others take on board the issues and implement changes in their lifestyles or aspirations that may effect positive changes. This is particularly encouraging when one considers that some EAT students are residents of informal settlements.

Community Engagement via 1st Year Modules
Many of the first year topics are everyday issues or relate international issues to the UWC/Cape Town environs, bringing the issues 'home' in an accessible manner. Most EAT students have indicated that they discuss EAT topics with parents, family and peers, typically four to seven other people. This form of dissemination, albeit anecdotal, takes information to many more than the number of students attending lectures. It also presents the information in a format that is accessible to the general population of Cape Town.

The overarching assignments attached to year one have included the preparation of posters, information booklets, resource files for environmental workshops etc. In each of these assignments the students have taken the material from EAT lectures, have augmented it with material specific to where they live (or work or play), and have presented it in a format accessible for their chosen target audience. This serves the double purpose of reinforcing what they have covered in class and developing the skills to rework the material to make it more appropriate for a different audience.

Community Engagement via 2nd Year Modules
A number of group exercises involving community or environmental engagement are undertaken in second year. A seven-week long campus monitoring exercise investigates a number of key environmental or sustainability related topics (e.g. electricity use, water pollution, waste generation) within the immediate UWC context. Some groups carry out fieldwork, collecting and analysing samples from campus. Others use data sourced from UWC or local concerns. Oral and written presentations are made. A campus wide environmental awareness day was held in August 2006. Groups were assigned a particular aspect (e.g. publicity, poster displays, spoken word competition, questionnaires, etc.) and each had to work towards a successful sub-event. Again, presentations and reports of the successes and failures of the projects were submitted for assessment. Both assignments involve considerable interactions with the UWC community, and in some cases, with the communities surrounding UWC and other external organisations.

Community Engagement via 3rd Year Modules
As discussed above, the third year is the implementation phase of EAT. This builds on the knowledge and skills

developed in years one and two respectively. The first group of students completed third year EAT in 2006 and attempted a range of individual projects including workshops, an indigenous gardening project involving a local high school and UWC's Environmental Education and Resources Unit, a recycling scheme, energy efficiency programme, a TB awareness campaign, radio station environmental talk shows and research projects. Not all projects were successful but all students spent considerable time working with or making contact with other UWC or external parties and all went through the process of project design. The 2006 projects linked students and UWC to organisations such as Selfhelp Manenberg (a community group uplifting a Cape Flats community notorious for its gangland violence and drug problems), two local primary and a secondary schools and the research wing of Two Oceans Aquarium (a major tourist attraction). A larger class in 2007 will undertake a wider range of projects. Proposed projects include short internships, HIV-AIDS/environmental health campaign, borehole water use and abuse, community recycling and e-waste recycling. It is unlikely that all the projects will succeed but many of them to a greater or lesser extent will.

Other Opportunities for Community Engagement at UWC
As noted above, sufficient interest was present at UWC for students to launch EATSOC: student action for sustainable livelihoods, a new society promoting an awareness of environmental and sustainability issues and practical approaches to dealing with some of the problems. The society was affiliated to the UWC Student Representative Council (SRC) in early 2007 and has an active schedule of events planned for the year including educational visits, charity events, educational activities on campus and fun events. Whilst many of the members are drawn from the body of EAT students this is by no means the exclusive source of members. EATSOC will present a different face to UWC and the outside world – it is not driven by staff members, it is administered by students who are sufficiently interested in the issues of the world around them and are motivated to make a difference. The major advantage of this is that it is the students themselves who are appealing to other students to take an interest in the environmental issues that affect them. Third year EAT students will also be able to collaborate with EATSOC, the society providing a suitable outlet and human resources for their individual projects.

EAT students have also played an active role in the programme of the Learning Cape Indaba, UWC's Division for Lifelong Learning's programme of events forming part of the Western Cape Province's Learning Cape Festival, an annual month-long festival. Events that have been organised and run by EAT under this banner include environmental workshops both on and off campus and the campus-wide environmental awareness day discussed above. The 2006 awareness day involved a number of external parties including local and

regional government, Two Oceans Aquarium and a local environmental forum.

Benefits of EAT's Community Engagement
Many benefits of community engagement activities are experienced by EAT students. These are both educational and empowering (e.g. making real things happen, improved interpersonal skills, forging contacts with potential clients or employers, etc.). In terms of individual development, there are very marked differences between the approaches of typical first, second and third year students to individual and group projects – the confidence gained in the different modules of EAT contributes significantly to this personal development. Those students who have completed all three years of EAT have indicated that EAT has given them more confidence in their approaches to projects and to dealings with other parties – many of these practical skills are not covered in other programmes at UWC.

As an institution, UWC benefits from the positive publicity of community engagement from EAT. UWC has always taken pride in its engaged status with the surrounding communities in the struggle for democracy, and the communities that EAT touches today are assured that UWC is still an institution fighting injustice.

In terms of the environmental issues themselves, EAT is helping communities (including those at UWC) to engage. No longer are these issues the stuff of television or newspaper reports, happening in some faraway place. No longer are the members of the communities engaged by EAT distanced and ignored. Instead, EAT students, by being members of the communities themselves, are making distant issues relevant to the person in the street. This can only benefit the environment by raising awareness in the way that government campaigns cannot.

EAT's role in future sustainability plans for UWC and the region
Considering UWC's location and its past and current roles in South Africa, it lends itself perfectly to being a role model institution in promoting environmental sustainability and sustainable societies. The first steps towards this becoming a reality have already been taken in the form of the numerous extant research centres at UWC that are dealing with many of the fields crucial to this. EAT has provided a stimulus for this by bringing together the most diverse collection of academics for any teaching project at the University. EAT academics are now developing the plans for a new institute to promote sustainability at UWC and beyond.

Conclusions
EAT has grown from an idea to a mini-programme with around 150 students and over 25 staff volunteers from 12 different departments. It has shown that there is considerable interest in environmental issues at UWC. It has also shown that students can and want to make a difference and are prepared to engage actively in a variety of communities. The EAT students' efforts are already being felt at UWC and beyond its borders. With plans to develop more capacity to investigate issues relating to sustainable societies and implement meaningful solutions, UWC, as a potential role model institution, can contribute greatly.

Intergenerational issues in Education for Sustainable Development (ESD)

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Abstract
Early years learning is seen as a vital period in the formation and development of attitudes. However, it is also widely recognised that beyond the classroom the views of adults from a previous generation are influential. This paper reviews the potential intergenerational conflicts that relate to ESD and discusses strategies to promote ideas and concepts to parent groups. It is argued that ESD for children can only take place effectively beyond formal educational settings. Through a review of the efficacy of present strategies it suggests that adult education should have increasing primacy as a vehicle for delivery.

Introduction

Environmental education within the UK context is characterised by two major approaches: Firstly the factual, field studies approach, in which children are introduced to the environment through a simple understanding of ecology; and the second approach which was made popular by the work of Cornell (1979, 1989) and others (Hodgson & Dyer, 2002). This involves a deeper engagement with the environment, concentrating less on the observed relationships within habitats, and more on the relationships between the child and the environment.

The former prioritises an intellectual, cognitive, understanding of the natural environment. It may include (depending on the children's developmental level), such things as the practical examination of pond biota, or the more theoretical understanding of ecological relationships, such as predator-prey, and trophism. The second approach focuses on the development of an emotional or "affective" (Bloom, 1956) engagement with the environment. It involves promoting awareness through the full range of senses, and includes activities such as adventurous play. There is an increasing emphasis on such approaches and this is evidenced by such developments as the Forest Schools Initiative (Kirkham et al., 2005) and the Wild about Play group (http://www.playwork.co.uk/wildaboutplay/) based at the University of Gloucestershire (UK). The inadequacy of purely cognitive understanding in the promotion of environmentally benign behaviour is also recognised by the UK government:

> Information does not necessarily lead to increased awareness, and increased awareness does not necessarily lead to action. Information provision, whether through advertisements, leaflets or labelling, must be backed up by other approaches.
> (Demos & Green Alliance, 2003, cited in DEFRA, 2005).

The two approaches are, of course, rarely mutually exclusive. However, the more knowledge based (and thereby more 'academic') field based work tends to have a greater emphasis in the teaching of older students, whilst the deeper engagement of the sensory world, is a more popular mechanism for engaging younger children. It is not uncommon, within the pre-school and primary sectors in the UK, for children to play and work with materials in the natural environment. However, whilst the environment may still form the basis of later curriculum study, such sensory approaches to environmental education are rapidly replaced beyond the early years.

The received wisdom of such a shift in teaching style stems from the idea that as children develop they are capable of greater conceptual understanding. Such intellectual processes are thereby seen as leading to a greater awareness and consequently a greater concern for, and appreciation of, environmental issues. Ballantynn, Fein and Packer (2001) observe a preference for more cognitive environmental activities in older children, and there may be a tendency for this to supplant their perceived needs for emotional contact with nature – and thus demean its value in the mind of the learner.

Whilst there are a number of works which identify the development of greater environmental awareness through enhanced, but essentially orthodox, teaching of environmental education (Xue et al., 2006; Castillo & García-Ruvalcaba, 2002; Carter, 1998) there is a growing body of literature which actually finds little correlation between the two (De Chano, 2006).

This lack of correlation between environmental knowledge and environmental engagement questions the validity of environmental education within the school curriculum. Despite student learning about the operation of the environment through the study of ecosystems, energy flows and simple ecological relationships, it would appear that attitudes to the environment, relating to lifestyle and attitudes to production and consumption remain unaffected (Cutting & Cook, in press). If this is the case, then other influences on the way that environmental attitudes are developed need also to be identified.

Eagles and Demare (1999) have suggested three primary influences on children's attitudes to the environment. Firstly, the influence of television programmes. Wildlife programmes designed and directed at young viewers appear to be significant in developing greater appreciation for the environment and concern about potential threat. The second influence concerned what children had read from books at school. The most significant and perhaps most overlooked influence is that of parental attitude. Children only spend a small period of time in formal

education and as a result the influence of the school can never be as profound as is sometimes suggested. However, children are immersed in the views of family and peers at other times and such powerful influences would, quite naturally, take precedence at a time when children are beginning to formulate views and opinions.

Ballantyn, Connell and Fein (1998) indicate the degree to which children can influence parental behaviour and act as "catalysts for environmental communication". However, this is clearly not always the case. Parental attitudes, and indeed practice, may often be in conflict with the environmental ideas that are being encouraged by the school. Where this occurs it is easy to envisage parental views and the values imbued by the domestic situation taking primacy for the child, or at least militating against the adoption of environmental values developed at school. Such a development would not necessarily negate the cognitive understanding of environmental science and ecological principles; however it may well invalidate much of the new sense of values and empathy and subsequent care of the environment.

Therefore, if environmental education is to be effective in promoting attitudinal change, it may require a more inclusive approach, involving parents and the wider community.

Whilst engaging parents in the learning of their children is likely to enhance enormously the adoption of environmentally beneficial values and attitudes, there are other benefits that relate to the wider considerations of sustainable development of which environmental welfare *per se* is just one part. The absence of parental involvement in the lives of their children, especially amongst disadvantaged, low income, and single parent families, has been a growing cause of concern for childhood development and has been associated with the growth of juvenile anti-social behaviour and criminality. Such character traits are clearly antipathetic to the development of environmentally responsible behaviour in individuals so the promotion of opportunities for parental engagement with their offspring would in itself support the effective promotion of sustainable development. Such improved familial interactions may then be further supported by improved social interactions through local environmental initiatives with the local community. Thus, whilst there is a growing acceptance that intellectual ecological understanding needs to be complemented with appropriate engagement with the natural environment, it can be enhanced through the involvement of parents within the learning process, but in doing so, the potential for wider community development should not be ignored.

An Illustrative Strategy for Parental Inclusion: The Parents as Educators programme (PaE)
What follows is a briefly described qualitative example of a strategy adopted to encourage parental involvement in the environmental education of their children.

PaE was an attempt to broaden the scope and impact of

environmental awareness within the context of the wider urban community. The Project was funded by the LSC Local Initiative Fund. The aim of the project was to encourage young parents to become involved in their children's education through offering a National Open College Network (NOCN) accredited level 2 qualification which will enable them to understand and support their own children's environmental learning at Key Stage One. The funding specifically required that the parents be under 25 years of age, with no formal qualifications and be resident in local authority identified 'areas of deprivation'.

In the pre-project period three strategies needed to be developed. Firstly, one that dealt with contact and recruitment. Secondly, the development of appropriate teaching and learning strategies. Thirdly, criteria for evaluating the relative success, or failure, of the programme.

Recruitment Strategy
The issue concerning the programme team was how to contact and attract such groups. The 'areas of deprivation' formed the geographical focus to the project and the most obvious starting point was the local schools. The programme team approached the schools with a view to putting on extracurricular environmental events for children. These were conducted after school hours and consequently at a time when parents would be waiting to take children home. Carrying out these activities with children was essentially a mechanism for contacting potential students, for as the children were involved with the event, it afforded time for the team to approach the waiting parents and talk to them about the programme. This was the primary point of contact and was subsequently identified as the most effective marketing tool (Desira, 2003).

Further to this, a wide range of community groups was also contacted including:
• First schools;
• Pre-school nurseries and toddler groups;
• Community centres and community health centres;
• Organisations and networks supporting young adults.

Recruitment needed to be complimented by an appropriate response from the provider. The course design needed to overcome institutional gate-keepers and provide child care for pre-school children, as well as being timetabled sympathetically to the demands of single parents.

In June of 2003, the pilot programme recruited 35 students. Given the difficulty in contacting and encouraging such young parents back into an educational setting, recruitment was seen as a significant success.

Course Content
The programme was designed around the UK National Curriculum Key Stage 1 (www.curriculumonline.gov.uk/) and used activities based on the sections concerning environmental education. The student/parents would then carry out the same sensory activities as their children

would be likely to undertake in school settings, both in the classroom and beyond.

Being adult groups, the students had an additional debrief session to inform them of the educational purpose of the activity. There were free discussions where the parents were encouraged to reflect and evaluate the activity. Parents were then encouraged to carry out the activity with their own children and to attempt to further evaluate its potential worth through practical application.

This evaluative feedback formed the first session of the following week's class. A new activity was then carried out and once again the parents were encouraged to evaluate it by carrying it out at home.

The final week involved exit interviews, relating to proposed future plans and an evaluation of the course. A very important part of this session included a 'Leaver's Celebration' social event, when the certificates were awarded and the children were invited to watch and support their parents as they received the award.

Evaluation Strategy
Data gathering began in April of 2003 and involved conducting semi-structured interviews with a selection of participants to provide an in-depth exploration of their backgrounds, views on the project and how these had impacted on their aspirations for the future. Key internal stakeholders were also interviewed to provide an overview of the development of the project in the initial stages.

Such methods were essentially qualitative and aimed to explore the perceptions and experiences of a 'purposive' sample of the staff team and students. Purposive sampling allows cases to be selected to illustrate particular features that may be of interest (Silverman, 2000, p. 104).

A series of face to face interviews with the college team and 16 (52%) of the student cohort was conducted. The evaluation operated under an evaluation protocol which protected the interests of the participants and incorporated issues of confidentiality and anonymity. The protocol was explained to participants and data was anonymised.

Reflections on Recruitment
Interviews with the course team suggested that the programme was viewed as a success. However, the lack of confidence amongst the cohort was identified by the staff as being a very real issue, particularly when related to the delivery of the programme.

> …Well there was a very diverse range of abilities, so there had to be a lot of differentiation. Obviously the more able students were doing it to support their children and out of interest as to what their children would be doing at school. Whereas the less able students really needed support in becoming more confident in getting involved in the activities.

The social background of the students was also highlighted in interviews as influencing the approach taken to the delivery of the environmental units.

> …many of the group had had fractured schooling and the last thing I wanted to do was to put them off learning by throwing loads of principles and theory at them. I just wanted to get them used to thinking a little deeper and being confident enough to talk.

The confidence of the parents was increasingly seen as paramount, even as possible learning difficulties were suspected. While recording the concern, this course began to be seen not as an academic programme, but one which encouraged participation in the first instance.

> …it would have been inappropriate for me to be saying "you need to get help with this and that." It wasn't that type of course…we just wanted a course that would let young parents learn how to be with their children.

Reflections on the Course Content
The environmental content involved observation and was based around observation and questioning. To provide wider sensory experience the course would often involve outside work and such outdoor activities proved popular with the cohort and the learning value of these sessions was also recognised by the students: "I don't think you can understand, or get an idea of how things work unless you see it".

The non-traditional approach to the environment was perhaps a little unfocused, but that did not appear to negate the wider experience of the student cohort: "We went out for a walk and just talked... that was good"; and "We walked down to the park and just chatted about the world… it was good to just sit and talk about stuff. So yes, it was a good time".

By doing such work, the group became socially cohesive and the fun aspect of carrying out activities designed for 5 – 6 year olds seemed to underpin this.

> It was quite interesting, (and) it was funny, we had a laugh you know. It was quite relaxed…a lot of it was group work and we sort of chatted about it in groups rather than working alone and that was good, because we were all just discussing issues freely.

> It's quite good really, to know what the children are doing at school and you can actually help them at home… You can talk about things…It's changed my confidence in like, you know, helping the children learn and like that.

Conclusions on the Programme
The exit interviews formed the basis for feedback and intended follow up sessions. Throughout these interviews one constant theme emerged, namely that of an associated improvement in the students' personal confidence. Indeed, all students mentioned this. 89% of the cohort, by the time of interview, intended to return to

some form of full-time or part-time education.

> It made me want to go to do bigger things now … it's got me back to College again and that's something I was really nervous about doing, so I think that's the biggest thing actually … it's got me back here and more confident.

> I want to do courses next year, but I can only do short courses because I have to look after the kids … but I want to help children.

> I still feel during the week I got nothing to do. I mean, yeah, you can go out with friends and things when they're at school and that, but I just need more than that now … I just need to use my brain a bit more … as long as I get some sort of knowledge now and again, I'm happy.

The improvement in confidence and the emergence within the cohort of an increasing interest in their own education were probably the two most important outcomes of the pilot project.

Conclusions and Recommendations

The promotion of environmentally benign behaviour in current and future generations clearly depends upon a wide variety of educational techniques which must place a high priority on developing personal and emotional connections with the natural world. For this approach to be effective, the full range of influences upon an individual's learning (beyond the formal school environment), must be considered. Central to this is the domestic and family context and the values that it generates. The "Parents as Educators" programme highlights the usefulness, and potential, of such inclusive educational courses in both supporting academic understanding and also in developing personal environmental attitudes and values. An added dimension, however, is the value that such a programme has for the implementation of the social aspects of sustainable development. In this respect it raised self esteem, motivation, and a sense of social inclusion within the most marginalised in society. This not only promotes a mindset that is more conducive to environmental activism, but also one that encourages a sense of social involvement and empowerment that in turn facilitates a sense of social equity.

Further research in this field would usefully be directed at identifying processes which motivate parents and children in further independent or mutually supporting engagement with the natural environment. It would be valuable, for instance, to discover the influence of such educational programmes in the engagement of individuals and families into various neighbourhood environmental activities. This might include such schemes as neighbourhood composting; the development of neighbourhood parks and wildlife plots; local food initiatives, and other environmental activism. The development of such wider, environmentally active, social networks would not only provide avenues for the continuation and practical implementation of environmental education, but also promote the sort of community structures of motivated individuals that would help fulfill the needs of sustainability.

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4 | Learning in a Changing World and Changing in a Learning World: social learning towards sustainability

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Introduction

Moving towards sustainability or sustainable living, inevitably involves diverging norms, values, interests and constructions of reality. A key premise of social learning is that such differences need to be explicated rather than concealed. By explicating and deconstructing the oftentimes diverging norms, values, interests and constructions of reality people bring to a sustainability challenge, it not only becomes possible to analyse and understand their roots and their persistence, but also to begin a collaborative change process in which shared meanings and joint actions emerge. This learning can take place at multiple levels i.e. at the level of the individual, at the level of a group or organisation or at the level of networks of actors and stakeholders.

Social learning often includes a critical analysis of one's own norms, values, interests and constructions of reality (deconstruction), exposure to alternative ones (confrontation) and the construction of new ones (reconstruction). Such a change process is greatly enhanced when the learner is mindful and respectful of other perspectives. Obviously, not all participants in a social learning process display the same amount of initial openness and respect, but as they develop social relationships and mutual respect (social capital), they not only become more open towards ideas alternative to their own, they, as a group, also become more resilient and responsive to challenges both from within and from outside.

The WEEC panel on social learning towards sustainability discusses key principles of social learning in the context of environmental education and sustainability. The panellists all have contributed to "Social Learning towards a Sustainable World" (Wals, 2007) which contains contributions from over 50 researchers and practitioners from 6 continents. Some of these principles are highlighted in this paper.

Conceptualising sustainability challenges

The nature of sustainability challenges seems to be such that a routine problem-solving approach falls short as transitions towards a more sustainable world require more than attempts to reduce the world around us into manageable and solveable problems. Instead, such transitions require a more systemic and reflexive way of thinking and acting with the realisation that our world is one of continuous change and ever-present uncertainty. This alternative kind of thinking suggests that we cannot think about sustainability in terms of problems that are out there to be solved or 'inconvenient truths' that need to be addressed, but need to think in terms of challenges to be taken on in the full realisation that as soon as we appear to have met the challenge, things will have changed and the horizon have shifted once again.

After twenty years or so of talk about sustainability and sustainable development, both in theory and in practice, it has become clear that there is no single outlook on what sustainability or sustainable development means. It is also clear that there is not one process that will confidently realise its achievement. Determining the meaning of sustainability is a process involving all kinds of stakeholders in many contexts, people who may not agree with one another. There are different levels of self-determination, responsibility, power and autonomy which people can exercise while engaged in issues or even disputes related to sustainability. In dealing with conflicts about how to organise, consume and produce in responsible ways, learning does not take place in a vacuum but rather in rich social contexts with innumerable vantage points, interests, values, power positions, beliefs, existential needs, and inequities (Wals & Heymann, 2004; Wals & Jickling, 2002). The amount of space individuals have for making their own choices, developing possibilities to act and for taking responsibility for their actions, varies tremendously. Hence, creating a world that is more sustainable than the one currently in prospect, might have something to do with the utilisation of diversity, the creation space for learning and innovation, and overcoming inequities and power imbalances that limit certain peoples' possibilities to participate.

Learning systems

Fritjof Capra sees ecosystems as learning systems that have developed a numbers of traits that he considers both crucial and exemplary for social systems, including: resilience, flexibility, adaptive, and networked connectivity (Capra, 1994, 1996, 2007). All these traits combined lead to sustainability and continuity. The essence of sustainability, Capra maintains, lies in the way ecosystems are organised and are able to respond to disturbances/crises. Healthy (eco)systems are systems that are continuously learning. Capra suggests that creating a more sustainable world requires that we have a better look at how ecosystems work and become competent systems thinkers. Systems thinking here broadly refers to things like: seeing connections and inter-relationships, fine-tuning functions and roles, utilising diversity and creating synergies (see also Sterling, 2004; Tilbury, 2007).

Social learning is often referred to as a way of organising individuals, organisations, communities and networks, that is particularly fruitful in creating a more reflexive, resilient, flexible, adaptive and, indeed, ultimately, more sustainable world (Keen et. al., 2005; Wals, 2007). The adjective 'reflexive' has been added here to stress the important, but underused, human ability that has been identified by a number of scholars as a key aspect of (transformative) (system) learning (Loeber et al., 2007; O' Donoghue et al., 2007; McKenzie, 2007; Dyball et al., 2007). A learning system has to be reflexive in order to be willing and able to question

(and break away from) existing routines, norms, values and interests. A reflexive society requires reflexive citizens able to participate in and contribute to processes of change.

Social learning
One could argue that the idea of social learning is attractively vague still. Nonetheless it is safe to say that social learning tends to refer to learning that takes place when divergent interests, norms, values and constructions of reality meet in an environment that is conducive to meaningful interaction. As suggested earlier, this learning can take place at multiple levels i.e. at the level of the individual, at the level of a group or organisation or at the level of networks of actors and stakeholders. In their book on environmental management Keen et al. (2005, p.4) describe social learning as "… the collective action and reflection that occurs among different individuals and groups as they work to improve the management of human and environmental interrelations". In the context of sustainable environmental management, they speak of five braided strands of social learning: reflection, system orientation, integration, negotiation and participation.

From the idea of 'sustainability as emergence' (Bawden, 2004), moving towards sustainability as a social learning *process* is more interesting than sustainability as an expert pre-determined transferable *product* (i.e. as set by a policy, code of behaviour, charter or standard) (Jickling & Wals, *in press*). Through facilitated social learning, knowledge, values and action competence can develop in harmony to increase an individual's, a group's or a network's possibilities to participate more fully and effectively in the resolution of emerging personal, organisational and/or societal issues. In social learning, the learning goals are, at least in part, internally determined by the community of learners itself.

The point of social learning is perhaps not so much what people should know, do or be able to do, which could be an embodiment of authoritative thinking and prescriptive management, but rather: How do people learn? What do they want to know and learn? How will they be able to recognise, evaluate and, when needed, potentially transcend or break with existing social norms, group thinking and personal biases? What knowledge, skills and competencies are needed to cope with new natural, social, political and economic conditions, and to give shape and meaning to their own lives? How can social learning build upon people's own knowledge, skills and, often alternative, ways of looking at the world? How can the dissonance created by introducing new knowledge, alternative values and ways of looking at the world become a stimulating force for learning, creativity and change? How can people become more sensitive to alternative ways of knowing, valuing and doing, and learn from them? How do we create spaces or environments that are conducive to this kind of learning? These questions not only suggest that learning in the context of sustainability is an open-ended and transformative, but also that it is rooted in the life-worlds of people and the encounters they have with one

another. It is these 'encounters' that provide possibilities or opportunities for meaningful learning as they can – however, not automatically – lead both to (constructive) dissonance and increased social cohesion. The value of 'difference' and 'diversity' in energising people, creating dissonance and unleashing creativity has been repeatedly mentioned by several scholars who have reflected on the meaning of social learning in the context of sustainability (Wals, 2007). Many also speak of the power of 'social cohesion' and 'social capital' in creating change, and building resilience, in complex situations characterised by varying degrees of uncertainty. In addition to the importance of social cohesion, diversity and dissonance, the power of collaborative action that preserves the (unique) qualities of each individual, is mentioned by a number of scholars (Glasser, 2007; Apple, 2007; Bradbury, 2007).

The success of social learning depends a great deal on the collective goals and/or visions shared by those engaged in the process. Whether such collective goals and/or visions can actually be achieved depends, to a degree, on the amount of space for possible conflicts, oppositions and contradictions. In social learning, the conflicts and their underlying sources need to be explicated rather than concealed. By explicating and deconstructing the oftentimes diverging norms, values, interests and constructions of reality people bring to a sustainability challenge, it not only becomes possible to analyse and understand their roots and their persistence, but also to begin a collaborative change process in which shared meanings and joint actions emerge.

Conflict and dissonance, framing and reframing
Given the importance of conflict and dissonance in social learning, it is important to be mindful of people's comfort zones or dissonance thresholds. Some people are quite comfortable with dissonance and are challenged and energised by radically different views, while others have a much lower tolerance with regards to ideas conflicting with their own. The trick is to learn on the edge of peoples' individual comfort zones with regards to dissonance: if the process takes place too far outside of this zone, dissonance will not be constructive and will block learning. However, if the process takes place well within people's comfort zones – as is the case when homogenous groups of like-minded people come together – learning is likely to be blocked as well. Put simply: there is no learning without dissonance, and there is no learning with too much dissonance! Ideally facilitators of social learning become skilful in reading peoples' comfort zones, and when needed, expanding them little by little. An important role of facilitators of social learning is to create space for alternative views that lead to the various levels of dissonance needed to trigger learning both at the individual and at the collective level.

Frame awareness, frame deconstruction and reframing (Kaufman & Smith, 1999) can be viewed as central steps in transformative social learning. People can become so stuck in their own frames – ideas, ways of seeing things, ways of

looking at the world, ways of interpreting reality – that they may fail to see how those frames colour their judgment and interaction. Perhaps the essence and success of social learning lies in people's ability to transcend their individual frames, so that they can reach a plane where they are able find each other and create enough 'chemistry' to feel empowered to work jointly on the challenges they come to share. An important first step in social learning is becoming aware of one's own frames. Only then can deconstruction (sometimes referred to as de-framing) begin (Wals & Heymann, 2004). Deconstruction is then seen as a process of untangling relationships, becoming aware of one's own hidden assumptions, their ideological underpinnings and the resulting blinding insights they provide. When this is done in a collaborative setting, where dissonance is properly managed, cultivated and utilised, participants become exposed to the deconstructed frames of others, they begin to rethink their old ideas and are challenged to jointly create new ones (co-creation).

But what about sustainability?

People around the world, scientists and policy-makers alike, are working on identifying 'indicators of sustainable development' (130,000 Google hits on March 8th, 2007) or 'sustainability indicators' (393,000 Google hits on March 8, 2007). Many scientists working on sustainability are doing so at the request of international organisations like UNESCO, UNECE, UNEP and the World Bank, or at the request of national governments. Sustainability and sustainable development - but also 'Education for Sustainable Development' (500,100 Google hits on March 8th, 2007) as a means to 'realise' sustainability - have deeply penetrated the world of policy. There is quite some pressure to translate these policies into concrete actions with measurable outcomes by creating benchmarks and standards that heavily rely on Specific, Measurable, Acceptable, Realistic, Time-specified (SMART) goals. To have an exhaustive list of sustainability indicators seems very handy for becoming SMART in working towards a more sustainable world, but at the same time might take the learning out of moving towards a more sustainable world, and, therefore, ironically perhaps, block any progress towards such a world.

This is not to say that having indicators for sustainability is necessarily a bad thing, but the questions then become: For whom are these indicators? How have they been created? By whom? Are they carved in stone or subject to change and even abolition? The process of identifying indicators can in and by itself be a very useful part of social learning, but when indicators are then authoritatively generated and prescribed, the transformative learning disappears and is replaced by the kind of conditioning and training that might be damaging in creating a more reflexive, empowered, critical, self-determined citizenry that competently and creatively co-designs a more sustainable world.

Interestingly enough *none* of the 27 contributions to 'Social learning towards a sustainable world' (Wals, 2007) focuses

on sustainability as a measurable outcome. Instead they focus on the *processes* and the *conditions* needed to *engage* people in issues related to sustainability. Most of them, however, will probably agree that our current way of living on this planet is unsustainable and something needs to change, indeed radically, in the way we live, interact, do business, use resources, and so on. They suggest – some more explicitly than others – that it would be pretentious to declare what 'sustainability' is exactly, let alone how it should be implemented. In fact, they suggest that doing so would take the learning out of creating a more sustainable world, whereas, in their view, the key to creating a more sustainable world lies precisely in *learning*. More specifically: not just any learning, but rather in transformative learning that leads to a new kind of thinking, alternative values and co-created, creative solutions, co-owned by more reflexive citizens, living in a more reflexive and resilient society.

Conclusions

Sustainable living requires more than consensus in the present about what sustainability is or even might be. While there is a constellation of ideas as to what a sustainable world might entail, the lack of consensus about the implications of an exact meaning – if this were at all possible – in variable contexts, should prevent global prescriptions. Instead contextual solutions are required that are, at least partly, co-created and co-owned by those who are to (want to?) live sustainably. Forcing consensus on how people should live their lives is undesirable from a deep democracy perspective, and from an emancipatory education perspective it is essentially 'mis-educative' (Dewey, 1916; Wals & Jickling, 2002).

Social learning - albeit as a spontaneously emerging property of people interacting together or as an intentionally introduced and facilitated process of change - not only allows for commonalities and social cohesion to form, it also provides space for disagreement and 'dissensus'. From this perspective democracy and participation, much like social learning, depend on this space for difference, dissonance, conflict, and antagonism. This also suggests that in reflexively fumbling towards sustainability, deliberation is radically indeterminate (Goodman & Saltman, 2002). The conflicts that emerge in the exploration of sustainable living become prerequisites *for* rather than barriers *to* learning. Sustainable living requires dialogue to continuously shape and re-shape ever-changing situations and conditions. A dialogue here requires that stakeholders involved *can* and *want* to negotiate as *equals* in an *open* communication process which values *diversity* and *conflict* as driving forces for development and social learning. Hence, a key challenge for EE, ESD, EFS, LfS and EE lies in facilitating dialogical social learning that helps create a more reflexive society capable of responding adequately to emerging crises and challenges irrespective of their label.

References (available upon request via arjen.wals@wur.nl)

Scrutinising the Bill: The need for transformative Environmental Education

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Abstract

There is considerable confusion over the meaning of sustainability and sustainable development. In this paper we differentiate between strong and weak sustainability arguing that the analysis of sustainability and sustainable development strategies must be addressed at the level of the relations of production, consumption and political relations. Our view is that while the threatened environment must lie at the centre of concern, this threat can only be addressed by examining the social relations that cause and profit from endangering the environment. Having differentiated strong and weak sustainability in these terms, our paper concludes by suggesting a transformative environmental education model. We illustrate it through two examples of current educational practice: action competence and the Forum Theatre (Theatre of the Oppressed).

The rhetoric of sustainability and sustainable development

While the science of climate change is increasingly uncontested, this cannot be said for our technological, political and educational responses to global warming. Sustainability and sustainable development have become highly contested concepts which have come to mean whatever we want them to mean. Over a decade ago it was claimed that that there were in excess of 300 definitions of sustainability and sustainable development (Dobson, 1996). Jickling argues that "Only a thin sliver of the definitions had the capacity to lead citizens to challenge fundamental assumptions. So, from where we sit at environmental education conferences, sustainable development might look like a reasonable idea to many. But in the larger picture, we might ask, who is most successful in co-opting the discourse? Whose interests are being served?" (Jickling, 2005, p. 251).

The terms sustainability and sustainable development are often erroneously used interchangeably. According to Porritt, sustainability is the "capacity for continuance into the long-term future"; consequently it does not have an endpoint (Porritt, 2007, p. 21). In contrast, sustainable development should be seen as, "the process by which we move towards sustainability" (ibid.). Development has usually been interpreted as implying controlled economic growth with a result that the primacy of economic growth has largely been unquestioned. The UK's sustainable development strategy published in 1999 identified the maintenance of high and stable levels of economic growth and employment as one of the four main objectives (DETR, 1999). This has now been replaced by a new framework goal which identifies 'living within environmental limits'

and 'ensuring a strong, healthy and just society' as the two overarching principles, which will be realised by 'achieving a sustainable economy', 'promoting good governance' and 'using sound science responsibly' (Defra, 2005). Each of these goals is open to multiple interpretations, but at least this approach allows for a wider reading of the meaning of development which could include education, health and democracy, or even freedom (Sen, 1989).

Sustainable development as ideology

The way in which the term sustainable development entered official documents sheds light on the way in which it has become a compromise between social actors/movements concerned with the environment, governments, and transnational corporations. Alain Lipietz, economist and leading member of the French Green Party recounts the story:

> The original idea of ecodevelopment began from the observation that the development model of the seventies entailed too much consumption of raw materials and produced too much waste. The first major United Nations Conference on the Environment, in Stockholm in 1972, endorsed an ecodevelopment model in which local communities were supposed to guard against these two errors. (…) Then came the second major conference, in Rio in 1992(…). One of the preparatory meetings was the United Nations Commission for the Environment, presided by Mrs. Brundtland, the social-democratic prime minister of Norway. The commission immediately ran up against the opposition of the United States, which refused any discussion of ecodevelopment. It was permitted to say that the needs of the present generation should be satisfied without compromising the possibilities of successive generations, and to call this demand "sustainability." But the term "ecodevelopment" was taboo, to the extent that it connoted the end of unbridled free trade, the prohibition of the exploitation of one territory by another, and so forth (Lipietz, 1996).

Ideologies must be as broad as possible in order to enable different groups with even antagonistic interests to find their interests in them. As Lélé expressed it: 'Sustainable development is a "metafix" that will unite everybody from the profit-minded industrialist and risk minimising subsistence farmer to the equity-seeking social worker, the pollution concerned or wildlife-loving First Worlder, the growth-maximising policy maker, the goal-oriented bureaucrat, and therefore, the vote-counting politician' (Lélé, 1991, p. 613). Thus, from the

point of view of organising consensus from above, the confusing notions of sustainability can be seen as a strength rather than a weakness.

Strong and weak sustainability – structuring existing approaches

Dobson (1996) differentiated between weak and strong sustainability using the question: what is to be sustained? In this context, substitutability provides the legitimation for the nature of the answer. At one end of the continuum we find the position that everything that exists in nature could be substituted by human-made products; if that were the case, nothing would have to be sustained. On the other end we find the position that nothing can be substituted, therefore everything would have to be sustained (Table 1). The first argument represents a functionalist view where nature is seen in terms of its usage for humans. The second view regards nature as a value in itself, independent of its utility for humans.

Huckle and Sterling (1999), return to differentiating between weak and strong sustainability around the question: how is sustainability to be achieved. For them weak sustainability implies retaining the *status quo* of societal relations which have been responsible for environmental degradation. Weak sustainability does not question the private ownership of the means of production; it claims that market forces can bring about a sustainable society. According to Huckle and Sterling (1999), the sustainability in this model would mean to substitute dangerous products for less dangerous ones, and the extensive for intensive exploitation of nature. The growth in Corporate Social Responsibility (CSR) is a response aimed at reconciling corporate interests with environmental needs and the demands of concerned citizens and the environmental movement. Maintaining the current relations of production implies that there are few constraints on what and how corporations produce within a free market economy. Participation does not question the freedom of companies to produce what and how they want.

Strong sustainability contests this strategy and challenges the current relations of production by questioning the freedom of corporations and the workings of the free market through government and citizens' interventions. This leads not only to changing the character of products and ways of production (e.g., CSR and government programmes like the Market Transformation Programme) but also the existence and quantities of production. Furthermore, there would be forms of participation that involve citizens defining the political processes of societal control, not just participating within a given framework. In real life, the distinctions we make in Table 1 are not as clear cut or mutually exclusive. There are a number of positions between the two we present. Even a radical position of strong sustainability would accept that replacing environmentally dangerous with environmentally friendly products is useful.

Table 1: Weak and Strong Sustainability

	Weak Sustainability	Strong Sustainability
What to Sustain?	Nothing: instead substitute natural resources for human-made products	Everything: there is no substitution for natural resources
Philosophies	Nature as functional for human beings	Nature as value in its own right
How to Sustain: Relations of Production	Maintaining Relations of Production: Private ownership of means of production = profit oriented production. Free Market without constraints	Transforming the relations of production: Challenging Free Market and decision making by company owners.
How to Sustain: Forms of Production	Production of environmentally friendly goods/services; exploit intensely instead of extensively	Restrict extensive growth, transform profit-oriented to needs-oriented production. Transform relationship humans/nature
Who Sustains?	Participation as consuming env-friendly products, recycling, etc. No power to intervene in decisions of companies or governments	Democratise political process. Participation in formulating the goals of environmental policies and production, not only in realising them.

A transformative environmental sustainability

In the following discussion we put forward a preliminary model of sustainability that seeks to address some of the problems we identified above. In our reformulation we refer to transformative environmental sustainability. This emphasises our positioning on the side of strong sustainability and our view that while the threatened environment must lie at the centre of concern, this threat can only be addressed by examining the social relations that cause and profit from endangering the environment.

Learning to live sustainably on this earth is non-negotiable as the earth's resources and capacities for absorbing and accommodating anthropogenic impacts is finite. On the other hand our wants are relative, insatiable and negotiable because they are the product

of political determination and social conditions. This makes it possible to generate certain questions, which have to be answered in order to know how to tackle environmental issues in relation to the social conditions within which they exist. What we claim is not that the individual elements of this model are new, but rather their arrangement[4]. Instead of adding up the economy, the social and the environment, we suggest looking at the specific social relations which form all these areas. The model, comprising the relations of production, relations of consumption, and political relations, can be equally used for developing sustainable development policies as well as for developing educational goals.

Relations of production

In order for societies to exist in an environmentally sustainable way they have to create relations of production that provide all members within the production process (and in society at large) an equal right to decide about the conditions and outcome of the process. This implies that decisions have to be informed decisions and that all members have to understand the context within which they take decisions. This has environmental education implications, as education can no longer be seen as simply incremental and an enhancement of people's personality but becomes an essential element of the relations of production, decisive for the ways in which we produce what we later consume. The current process of influencing the production process through choice and market mechanisms is inevitably retrospective. We suggest that education has an important role in helping informed citizens pro-actively decide what they want to produce or what they want to be produced, and maybe even what kinds of employment they want to undertake that will support a more sustainable planet. Instead of educating people to use long-life lightbulbs, they will be posing questions about the kinds of goods which are produced and whether they are actually needed.

The ways in which decisions about production are taken impacts on both the natural environment and its resources and the architectural environment like cities. The present relations of production are exploitative of nature and of human beings, and both these forms of exploitation have to be taken into account if one wants to create a sustainable world.

Relations of consumption

Consumption is the hot topic in sustainable development. If we talk about the relations of consumption instead, the focus shifts to the power relations through which consumption processes are structured. Relations of consumption indicate that there is a relation between the way in which a society produces and the way in which it consumes. The alleged power of consumers can always be countered by the power of

producers and retailers who can act in a more unified and organised way than the mass of unacquainted individuals with their differing interests, ways of life, and wants. While we do not deny that consumers can influence what is produced and how it is produced, the power of corporations/companies to create demand and to seduce us into buying far exceeds the power consumers can exercise. Relations of consumption include the power relations within the sphere of consumption. Bourdieu (1984) has analysed how consumption processes are part of the reproduction of class relations. Women, young people, and older people are targeted in specific ways to increase their consumption. Norms of beauty, body fitness, and 'coolness' are invented and applied to make sure that every social group consumes as much as possible, in order for each member to become what is said to be a successful individual.

Finally, consumption is also about ownership; in this case ownership over the means of distribution and decisions about the ways in which consumer goods reach, or do not reach, the consumer.

Political relations

As some authors have argued, if we want to work towards a sustainable society, we need to include the political institutions and the ways in which they function in the programme of transformation. The concept of 'social sustainability' is self-contradictory. If we want to build a sustainable society we have to transform social relations, instead of making the existing ones sustainable. The notion of 'participation' is usually used to mean inclusion into an agenda that is not supposed to be challenged by those who are to be included. Thus, challenging the political system and demanding true participation should also be central to a transformative environmental education.

Implications for a transformative environmental education

Environmental education has relied on teaching and learning models which are top-down and centre to periphery (Uzzell, 1999). Inevitably such approaches result in a simplistic view of social influence (e.g. Wertsch, 1991) which ignores the social and economic context in which people live; consequently it can be disempowering. Allied to this is that much environmental education has moralistic and normative undertones in which the acquisition of knowledge and people's own decisions are pushed into the background. Those who try to put across an environmental education message aspire to teach people about the environment, but rarely do they address and teach people about the social processes which mediate their relationships with the environment. Individuals may be positively disposed to act in sustainable ways, but they are not taught the repertoire of skills necessary to deal with, for example, social conformity pressures which discourage change.

[4] For a discussion of many of the ideas we draw on see: Braun and Castree, 1998.

People are not encouraged to reflect on the more general societal relations within which they live, their position within those relations and their ability to contribute to challenging them.

A dialectical theory of learning

If education is to meet the challenges we have identified and develop teaching and learning practices that focus on enhancing children's and adults' understanding of the relations of production and consumption, then it needs to be based on theories which focus on the "dialectical interaction between the social world and the changing individual" (Newman, Griffin & Cole, 1989). Pupils and adults must not only transform the conditions under which they relate to and impact upon the environment; there is also a need to transform social relations, and relations of production and consumption under which all actions take place. Through changing the social conditions under which they live, individuals also change themselves and vice versa: "The materialist theory concerning the changing of circumstances and of education forgets that circumstances are changed by human beings and that the educator needs to be educated" (Marx, 1888/1962, p. 5, our translation).

Vygotsky's dialectical theory of development considers learning as requiring conflict-generated problem-solving in which education provides opportunities for resolving dilemmas (Vygotsky, 1978). Such problems are located in society, the immediate environment of the child. In such an approach, consideration is given to the "totality of human agency and conceived as situated in socio-historical phenomena and in culture" (Markova, 1992, p. 1). The individual and the external world are linked in complex ways and can only be treated together as one phenomenon where neither the individual nor the social group nor the societal conditions can be defined without reference to the others.

Transformative education that understands environmental issues as a result of social relations must include an exploration of and a challenge to these social relations. Environmental education cannot reduce itself to teaching about the environment as if environmental problems are the result of the unconscious, uninformed, malevolent, inconsiderate or errant actions of individuals, rather than the result of specific relations of production, consumption and the political. The goal of environmental education must be to encourage people to formulate and find out in more systematic ways what they already know through their experience in the everyday, thereby revealing the more structural relations and ways in which we are all part of reproducing these relations in the everyday.

In Table 2, we specify some of the implications for education of the difference between weak and strong forms of sustainability.

Table 2: Transformative Environmental Education

	Weak Sustainability Education	Strong Sustainability = Transformative Environmental Education
Direction of education	Top down, centre to periphery	Dialogical and reciprocal
Philosophies	Dominant power group leading to normative and moralistic didactics; assumed consensus	Conflict
Function of education	Reaction and adjustment to the prevailing consensus	Articulation of competing interests and conflict resolution
Type of education	Transmit knowledge to people so they know how to consume the 'right' things, consume less, recycle, produce less waste, etc. Learning is about being a 'good' consumer. Disempowering.	Engage people in collective action to understand and challenge societal relations, relations of production, consumption and political relations. Learning is about gaining the competence, the development of socio-political skills, and an ability to act. Empowering.
Mode of action	Individualistic and reductionist	Collective, cultural and context-aware
Personal and social role	Passive; accepting who you are and your position	Active; changing relations and changing the self
State of society, environment and spect-actors	Predetermined and Static.	Dynamic.

Alternative notions of knowledge and the learning processes: Action competence

To conclude, we illustrate our ideas by describing two different approaches to education which we think embody these principles and have the power to address these issues.

Action competence is one educational approach which seeks to avoid the moralistic, values-driven approach of much environmental education. To have action competence is more than to possess knowledge, and have a theoretical understanding and concern about environmental problems: it involves understanding the problems sufficiently to develop solutions and possible action strategies. Action competence has had widespread application, especially in the areas of environmental, health and peace education for social change (Jensen & Schnack, 1994). An environmentally competent person is consciously solution-orientated, drawing on both natural

and social scientific critiques of societal-environmental problems, and requires a positive approach to co-operative decision-making, a respect for democracy and an understanding of participatory processes leading to sustainable actions within the context of people's own lives and environment (Uzzell, 1994). The value of action competence is that environmental issues can be conceived within a broader environmental context of causes and consequences and potential action. For example, water pollution through excessive nitrates may be caused by the over-fertilisation of land by farmers. This may be due to the encouragement given to farmers to overproduce through EU subsidies, which, in turn, may come about because of the strength of the agricultural lobby in the European Parliament, which itself is a result of the industrialisation of agriculture threatening the existence of smaller farmers. The individual's understanding moves back and forth from the concrete to the abstract, the scientific to the political and economical, and the local to the global. A similar process operates in respect of an understanding of downstream consequences of environmental actions, e.g., the local and immediate (a cleaner and healthier environment) to the global and long-term (a more democratic society).

Augusto Boal: The theatre of the oppressed

In the Forum Theatre, the animators (or 'difficultators') perform a short play on a specific issue, such as racism or domestic violence, but the medium could equally be used with environmental issues such as the provision of safe drinking water. Then, the piece is replayed, with the spectators encouraged to become "spect-actors" by stopping the action going on stage and acting out their suggestions. As Boal comments, "What is important for me is not exactly the solution that we found, [but] the process of criticizing, observing and trying to find solutions. Even if we don't find any solution at the end of Forum Theatre, I say, 'OK, it's good. We did not find that solution, but we looked for it'" (Boal, 1996).

Due to the resistance of the actors within a group it is not possible, according to Boal, for any actor/learner to impose solutions which are not possible in "real" life:

> Theatre is a representation and not a reproduction of social reality. FORUM-THEATRE presents a scene or a play that must necessarily show a situation of oppression that the Protagonist does not know how to fight against, and fails. The spect-actors are invited to replace this Protagonist, and act out – on stage and

not from the audience – all possible solutions, ideas, strategies. The other actors improvise the reactions of their characters facing each new intervention, so as to allow a sincere analysis of the real possibilities of using those suggestions in real life. All spect-actors have the same right to intervene and play their ideas. FORUM-THEATRE is a collective rehearsal for reality" (Boal, 2004).

Experience by one of us (Räthzel, 2001) with this method in the context of anti-racism education has shown its potential to develop and elicit people's creativity and potential to re-think their possibilities in order to change themselves as well as their living conditions. It enables a form of education which, like action competence, not only avoids moralistic undertones, but encourages and enhances people's capacity for action; people suddenly realise they know something and that what they know matters.

Concluding comments

The ideas presented above can be extended. Learners should be addressed as individuals within their social contexts. These include social relations in terms of class, gender, ethnicity and place, but also social relations in a more structural sense (i.e., local, national, global). Learning processes should include teachers and learners as well as addressing them as members of groups, e.g. trade unionists, inhabitants of specific neighbourhoods, women's groups. Local empowerment, often mentioned as a vital part of sustainability practices and EfS, has to be complemented by a broader view of national and global relations of production and consumption, and it has to develop those relationships from below. Transformative environmental education needs to inspire forms of action in which people can increase their collective control of their living conditions both in the local community but also in society at large. In other words, transformative environmental education should be about finding new forms of democratic participation that aim not to answer given questions but to formulate new questions and redefine the problems. In his poem, Praise of Learning, Brecht (1931/1992, p. 110-111) formulates this as follows:

> Scrutinize the bill,
> It is you who must pay it.
> Put your finger on each item,
> Ask: how did this get there?
> You must take over the leadership.

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Constructing Knowledge Trajectory for Local Theorisation : a pathfinder for learning and teaching.

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Abstract
The Knowledge Generation in the 21st Century requires new and multi-disciplinarily theory. With Indigenous Knowledge Systems (IKS) gaining recognition and research epistemologies requiring new insight into knowledge generation, new learning approaches are also required. Theorising with the indigenous world becomes both a challenge and an opportunity for environmental educators. This paper offers a new understanding of what is required for new learning and teaching using IKS methodologies, and for improving research by utilising multiple epistemologies.

Introduction

The search for new knowledge did not end with the collapse of colonialism or independence. The quest is stronger than before with researchers using the latest technology and sophisticated methods to gain access to indigenous and remote communities far better than anthropologists and philanthropists did. Just like their ancestors, travellers of the 21st century from Europe seek, through observation, indigenous practices and they collect material with a view to extending European medical databases and genetic modification techno-logies. Work to systematically tape and codify local knowledge continues and has increased in the 21st century.

What this exploration of past research into the world of indigenous people has done, is to improve research and thereby establish new theories of learning about the environment and the people who live in and from it. As observed by Ellen, Parkes and Bicker (2000), European relationships with local Asian knowledge was, paradoxically, to acknowledge it through scholarly and technical appropriation and yet somehow to deny it by re-ordering it in cultural schemes which link it to explanatory systems which are proclaimed as western. We need to avoid muting the local voices that provided information. Once local people become involved in knowledge codification, recording and acknowledging their ownership of the content and process, then knowledge generation will increase in ways that are respectful of the Indigenous Knowledge holder.

Learning and teaching theory formulation by non-western societies is currently regaining the mainstream out of struggle for centre stage occupation. To this end, developing learning material should involve the holders of indigenous knowledge, and what they know should not be reduced to exotic expressions of a long distance tradition but as currency in the knowledge development and knowledge era. However, an observation in this regard is required: IK has been grossly undervalued by western-trained 'scientific' managers in terms of its potential practical applications; when it was at last absorbed into 'scientific' solutions it was curiously insufficiently 'real' to merit any certain legal status or protection from the battery of patents and copyrights which give value and ownership to western scholarly knowledge and expertise.

In our effort to develop excellent learning materials on environmental education, a caution on the devastating act performed by dominant cultures is necessary. To this end Johannes (1987, cited in Ellen et al., 2000) notes that the inherent ethnocentrism and élitism of late twentieth-century global science has made it difficult for scientists themselves to accept that the folk have any knowledge of worth. What remains is a culture of denial which has been justified by methodological reductionism and an evaluative process which systematically renders such knowledge 'unscientific'.

Exploring the myth of absence of theorising in folklore
In his novel *Anthills of the Savannah*, Chinua Achebe (1987) provides a setting which demonstrates how indigenous knowledge developed theory from folklore and from observing animals. He writes:

> Once upon a time the leopard who had been trying for a long time to catch the tortoise finally chanced upon him on a solitary road. 'Aha,' he said; 'at last! Prepare to die.' And the tortoise said: 'Can I ask one favour before you kill me? The leopard saw no harm in that and agreed. 'Give me a few moments to prepare my mind,' the tortoise said. Again the leopard saw no harm in that and granted it. But instead of standing still as the leopard had expected the tortoise went into strange action on the road, scratching with hands and feet and throwing sand furiously in all directions. 'Why are you doing that? asked the puzzled leopard. The tortoise replied: 'Because even after I am dead I would want anyone passing by this spot to say, yes, a fellow and his match struggled here.'

In observing our task, that is all we are doing now, struggling. To no purpose except that those who come after us will be able to say: 'True our fathers (and mothers) were defeated but they tried.

The explanation of Achebe's insightful theorising is provided by Tukumbi Lumumba-Kasongo (Achebe, 1987) where a crisis area in the African education system is seen in the origins of knowledge taught in African

schools and how it is organised and managed. What is at question is the 'source of knowledge' and its manner of transmission to the public. It does not matter the location of what is taught but what counts is that learning remains a social and intellectual process. Lumumba-Kasongo notes that the knowledge that is acquired must relate to and/or direct the efforts of learners towards an understanding of themselves and their environment, and how they can reproduce both their environment and themselves. Lumumba-Kasongo attempts to find the relationship between knowledge and the metaphysical and social environment. The development of theory, practice and education does not relate to indigenous African epistemologies and metaphysics nor to social contexts. Hence, I began with folklore to illustrate that environmental education should be the basis for social ecological fundamentals in pedagogy. The development of theory within the indigenous world is not a struggle in the same way as in the western knowledge where cause and effect is based on laboratory experiments and tests. Looking at knowledge generation as postulated by post-independent African environmentalists, one finds the same struggle that the tortoise declared to the leopard: just not to die without a trace of battling for recognition and validation.

The challenge of creating a multiple approach which recognises local methodologies remains critical. Prior to providing new grounds of learning and teaching based on Ancient forms, the author prefers to explore trans-disciplinary and other methodological approaches that influence research. It should be noted that in order to produce the learning material, concerted efforts should be put into research and the administration thereof.

Walking evidence[5] and those who 'failed' the test in the laboratory of western science are rejected as non-scientific and thereby regarded as not fit to carry out and implement their theories. These 'failed tests' but 'walking evidence' are regarded in their own societies and communities as relevant and acceptable. These forms may include rain-making ceremonies, agricultural rituals, and reading of the stars as epistemologies for conservation, focusing weather or advancement of any local cosmo-vision practice. The disregard of other forms of finding facts, truths, including the 'ultimate cause', purpose and function by western developed science is a cause for critique in recent years.

A case in point is the use of indigenous knowledge in determining the effects of geo-physic or earthquakes in the Indonesian Islands during the last devastating tsunami[6]. The indigenous community could only survive

by using methods they learned from past generations which sustained them in a postmodern society. Never did they dismiss as outlandish their belief systems, their theoretical understanding of the environment and its inter-connectedness with animals, insects and fauna.

Bacon and the research method

Researchers in various areas of study are choosing approaches from a mixed vegetable bag, they have choice assorted and do not necessary have an exclusive discipline from which their thoughts are oriented or on which they base their research results. Results of scientific research will have impacts in various areas of life including the economy, health and new knowledge. It will affect other areas of learning including memory and prior learning. A methodological choice has shifted from the time Bacon believed that knowledge of nature should be turned to the benefit of mankind by exploiting new discoveries and inventions in a practical way (Henry, 2002). Bacon's 'logic of scientific discovery' was based on deductive logic as the only sound form of reasoning (ibid.). He believed that 'what was already known by traditional natural philosophy was mostly wrong'. Bacon later refined this premise to, 'inductive logic, the logic of everyday experience[7].'

It was Bacon who changed the 'researchers' or natural philosopher's (and not scientists at that time) approach to the understanding of nature to become the primary feature of his teachings, which led to modern science. Before this historical achievement by this western scholar, there was a general assumption among intellectuals that knowledge must be recovered from the past. His achievement made people forget the significance of wisdom, though. One may ask: Are we not going to learn from *Isilwane, the Animal*, a book by Baba Credo Mutwa[8] (Mutwa, 1996)? Are we not going to learn from the Maasai and the rest of us, the once forgotten occupants of territories prior to conquest? Can conservation and environmental education in the 21st century continue to ignore the fact that the dominant cultural expression in formulating theory and constructing world reality has not delivered for the developing nations what it promised with its western civilisation? We, the people of the south-south, should refuse to be demobilised!

Based on Bacon, the choice assorted of what counts as knowledge was limited and this gave birth to modern science which was regarded as the supreme form of forms

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of objective knowledge[9]. The critiques[10] of this notion of one choice developed the mixed vegetable bag wherein other knowledge also counted and continued to play a role in shifting the one-sidedness of knowing as projected by Bacon.

The movement towards trans-disciplinarity and multi-disciplinarity were earlier used and experienced in Ancient Egypt when religion, magic and knowledge of nature were much more closely connected, and even interdependent. It was at the end of the Renaissance that Bacon recognised the value of the magical tradition and was inspired by its emphasis on using knowledge to gain mastery over nature, and its emphasis on experience and experiment[11] to acquire that knowledge (Henry, 2002).

It is significant to realise that, by recognising alternatives in thinking about the content of science and method, one's understanding of how claims were arrived at, supports one's validity, clarity and strength in those claims.

It was later in his struggle with reason and experiment that Bacon moved on to note:

> When natural and divine philosophy was 'commixed together' it could only lead to 'an heretical religion and imaginary and fabulous natural philosophy. 'Science and religion don't mix.'

Bacon was concerned that religion and science should not be mixed in the wrong way[12]. A reading of the works by Fritjof Capra (1991) reveals that there is a link between science and religion. What is required is an improved discourse on interfacing knowledge and integrating approaches.

These '– ologies' are not all science: why?

There have been many citations in the last part of the previous century about what constitutes science and what does not by experiment and test – science. History and other humanities, although called science, appear lacking in the implementation process of tools and methodologies that are scientific. History, for example, is not regarded as science. What this science is all about in ecology, biology, geology and paleontology and not

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[9] This supposed objectivity of scientific knowledge, in so far as it does exist, is also the outcome of Bacon's views on science. Although the notion of objectivity was not a common trend in seeking the truth it was either true or false.

[10] The objectivity of scientific knowledge has come under increasing attack in recent years, particularly by sociologists of science who seek to show that it, too, is culturally biased.

[11] Experimental evidence does not speak for itself, but must be interpreted. It is this unfortunate part of interpretation that assumptions are reached which obscure alternatives.

[12] I move away from the confusion later caused by Bacon in his assertions. The significant part of his attempts to provide a better understanding of the role of science and methodological approaches is recognised, at least as a contribution in the early development of science and research.

counted in history and sociology, remains an issue closely engaged with by scholars who argue that 'science' means 'knowledge' to be obtained by whatever methods are most appropriate to the particular field. Evidence shows little difference in the methodological approaches, causation, prediction and complexity as seen in the carrying out of experiments in molecular biology, chemistry and physics when compared with history and literature. The problem with experimentation and evidence based outcomes is in the minds of people not in the reality that provide the very experiment and evidence. Take for example a person who has been taking a particular concoction for healing a disease. After encountering western developed science this person begins to wonder if the herb that has been taken for over 1000 years should be subjected to trials and tests, experiment and deduction.

With modern science requiring experiments and tests as proof, the walking evidence will be suspected even if the walking turns to running i.e. the patient gets better and better irrespective of what the controller thought (predicted). Experimentation should not, at this stage of methodological advancement, be the essence of the scientific methods (Diamond, 1997) at the expense of other forms of knowing and producing results in response to the environmental needs. Laboratory work, so much respected and trusted, cannot interrupt certain historical processes[13] for experiments and tests to provide scientific answers. It is at this stage that we look at what counts as knowledge in other communities.

So the cause and effect relationship as held by science continues to be under scrutiny. Diamond (1999), talking in favour of human societies and history as science, finds it difficult to establish cause and effect relations in the history of human societies equal to those of astronomers, climatologists, evolutionary biologists, geologists, and paleontologists. I can add to the list environmental changes and climate mutations.

Diamond should be cited in detail for the benefit of making a point about contradictions in cause and effect relationships:

> To varying degrees, *each of the fields* (referring to those above*, my emphasis*) is plagued by the impossibility of performing replicated, controlled experimental interventions, the complexities arising from enormous numbers of variables, the resulting uniqueness of each system, the consequent impossibility of formulating universal laws, and the difficulties of predicting emergent properties and future behavior.

If the 'ologies' are science then all should have a choice

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[13] Diamond (1997, p. 421) notes that: One cannot interrupt galaxy formation, start and stop hurricane and ice ages, experimentally exterminate grizzly bears in a few national parks, or rerun the course of dinosaur evolution.

about what method is best applied to get anticipated results or desired outcomes. A comparative approach and natural experiments are necessary for the journey to a reality. Hence Archimedes showed us the greatest of magicians and addressed the king: "Give me but one firm spot on which to stand, and I will move the earth". He demonstrated what he believed in and after many calculations and hard work he completed a gigantic system of pulleys and out of the water he dragged the Syracus, a three-masted ship of some fifty feet in length, full of cargo. The amazing spectacle is: science could dominate nature or, in other words, the control of science gave great power (Lafuente & Saraiva, 2001). The second is the Eureka! wherein Archimedes discovered the famous principle that a body submerged in water experiences a vertical upwards force equal to the weight of water displaced (ibid.). Society should continue to theorise and produce local Eurekas! To this end, IK has to provide its side of theory development and standards to be maintained in repeating such.

At the time of the greatest scientific discovery there was no mention or recognition of triangulation, multi-disciplinary or even trans-disciplinarity. However, a close look at research over time shows that different forms of knowing derived from practices other than science resulted in the success of experiments. Here we note that not all that is science requires a laboratory experiment.

Conversation with universalities of Knowledge
Post-colonial arguments rejecting the universality of science seem to disagree over the exclusivity of science. A number of cases were presented in recent years which questioned science and its exclusivity. They argued that modern science can be really culturally diversified only when it allows itself to be more inclusive.

Science, modern science, should include Indigenous Knowledge in its definition. The call for science to be inclusive of non-western scholarship is crucial and critical. The argument currently presented by proponents of the 'old science' school is that the dominant culture of knowledge, herein referring to science, should be the lead in setting research episteme and epistemologies. This means that even when one thinks of using multi-disciplines or even trans-disciplines, the centre which is the western science still holds. It is only out of empathy that Indigenous Knowledge and other knowledge systems get included in the modern sciences. We shall as environmental scientists and teachers ensure that a new agenda is set for science in the quantum theorising vocabulary. In using the new methodologies there is an effort to look at new ways of seeking the truth. Such a truth is sought by post-colonial critics who seek epistemologically different science, different from modern science (Saldana, 2001). It is Needham who argues for an ecumenical history of science that would recognise the different contributions of civilisations and cultures towards the growth of modern science (Saldana, 2001, p. 149). The observation made thus far is that

what is considered problematic is the privileging of a European version of universality over other definitions of universality – a paradox in terms.

We need to find out whether trans-disciplinarity, multi-disciplinarity or even inter-disciplinarity create a space 'to speak in terms of a critical enlightenment that would reinstate the dialogue across civilisations in more egalitarian terms' (Saldana, 2001). Critical scholars in the Afro-centric movement do not take it kindly when methodological and epistemological paradigms are just juxtaposed and imposed to the 'other' while over hundreds of years the very knowledge of the other has been ignored. While we may use existing multi-, inter-, and trans-disciplinary approaches to try to understand our reality, we have to realise that we do so with approaches that emanate from outside. The question is whether we can move further from this external orientation nearer to the inside.

Policy, Education and Environmental Education
Policy determines budgets and thus with proper policies, institutions expect to make profit or get grants. With sound policies on environment, countries can argue for a better budget slice. But this is not the case. Environment is constantly not regarded as a human right and the nature of policy options for teaching about its value is deteriorating. Why is it that only pressures from NGO's provide hope for policy changes? In order to have sound and endogenous policies we need a new world order in constructing knowledge and its production. Africa has a poor knowledge management plan and thus does not promote new processes of knowledge accumulation and capitalisation (Houtondje, 2005). Africa cannot develop good environmental policies with its present borders and political geography. The recent efforts to collaborate and form consortiums among African scholars and associations for environmental justice are in response to the disarticulated policies. A collective mobilisation of the African intelligentsia as a whole is therefore necessary to promote a new awareness (Houtondje, 2005).

New cultural and environmental policies, included in the science agenda are required as a corrective measure. Such policies should obviously be linked to economic plans. Environmental education cannot be left to the margins of any society or nation. Education about self-knowledge is known always to have been part of humanity. What is currently in question about education is that it alienates rural learners from their cultural and traditional experience with nature towards an urban technological and science fiction approach (Ntsoane, 2002). An absence of coherence in content development and linkages between national environmental bodies and curriculum development structures will perpetuate people talking and planning past each other. Environment is argued as a precursor for tourism and its serious educational agenda becomes reduced or ignored amidst the prioritising of the cash profits of tourism.

**Theorising, Indigenous Worlds and Environmental Educators**

In the opening part of this paper, the author cited Chinua Achebe to demonstrate how local indigenous communities theorise. Now a reference to a Native American (Cajete, 1994) will conclude this paper.

The earliest forms of human teaching are closely netted with subjective experience and rightfully placed in the environment, society and spirituality. Both the teacher and the learner were involved in producing and sharing knowledge. A communion between human beings and the natural environment was the source of indigenous education.

The indigenous world used the living place, the extended family, the clan/community and collective cosmology to produce learning materials. Self-knowledge was a key aspect in understanding life and the process of living, in determining one's own role and responsibility to the local people and link to spiritual requirements.

In order to theorise cultural metaphor and the continuity of knowledge, perception, experience, and wisdom were afforded through the understanding and experience of local elders and indigenous knowledge practitioners (Cajete, 1994). Listening, observation and experience/experiment was partly devoted to specialised people like healers or wordsmiths.

Environmental educators require the ability to use language through storytelling and oratory; song is also highly regarded as a primary tool for teaching and learning. We know from a young age the power of spoken or sung words. Ceremony is life-long introduction to sacred and environmental knowledge. Graduates were presented with new levels of knowledge when they were physically, psychologically and socially ready to learn (Cajete, 1994, p. 34).
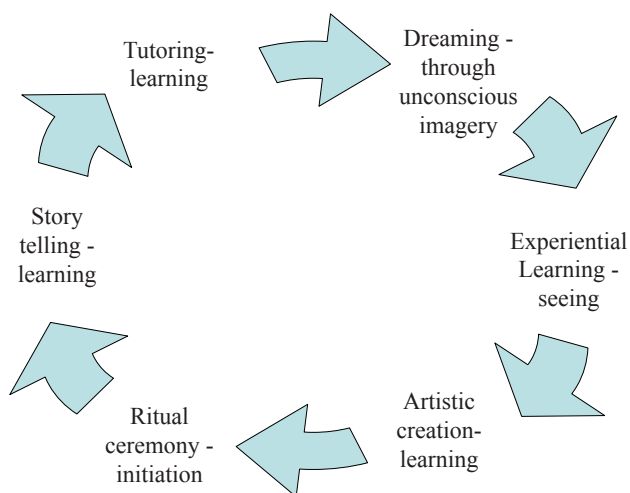
Through this cycle both learner and teacher have their realities engaged. The purpose of environmental education is fundamentally to attain knowledge, seek truth, wisdom, completeness and life as perceived by traditional philosophies and cultures around the world (Cajete, 1994).

Environmental education requires patience with each knowledge holder and the environment which turns to be the teacher. In most cases the learning materials developed do not have the wisdom-based expressions embedded in indigenous language. It is, therefore, significant to develop such learning material first in the local languages and later translate upon verification with the IK holders. Lupele (2003) holds a different view when it comes to developing material in the local languages:

> Contrary to the popular belief that material for rural communities should be written in local languages, preliminary findings from the contextual profile showed that there was no common local language of written communication …The only common language used was English, although most people were proficient only at an elementary level. The assumption that materials for rural communities should be written in the local language is derived from the way the term 'community' is defined.

Completeness of teaching in the ecological knowledge space can happen only when there is deliberate effort to connect nature, thinking, meditation and all other human activities for producing livelihoods in oneness with nature.

Schreuder (2005) notes that many researchers are often more concerned about being theoretically purist than about the quality of their research stories. In environmental education, it would seem that this means that one has to be deconstructive or postural, but at least critical. Schreuder questions the very quest for theory. However, Amilaca Cabral, in his lecture entitled 'Theory as a Weapon', defends the need to constantly theorise and valorise knowledge for strategy.

In the final analysis as we walk the evidence of local knowledge into the 21st Century, indigenous and local communities should continue to ensure that they hold onto their ways of knowing. Indigenous ways of knowing should continue to count the production of knowledge, either empirical or in other epistemes. Based on other educational methods, local African knowledge can contribute in many ways including the following:

- it recognises that learning and teaching require overcoming doubt;
- it honours the fact that learning requires seeing what is real about a situation, a thing, or an entity;
- it recognises that learning is about seeing the whole through the parts;
- indigenous thinking honours the reality that there are always two sides to the two sides. There are realities and realities. Learning how they interact is real understanding;
- from the indigenous perspective, the purpose of training in learning and thinking is to bring forth your personal power. Training develops your personal power

through focused attention, repetition and context;

- we learn through our bodies as much as through our minds;
- it recognises that the true sources of knowledge are found within the individual and the entities of Nature;
- it honours each person's way of being, doing, and understanding;
- it honours the ebb and flow of learning as it moves through individuals, community, Nature and the cosmos;
- its purpose is to teach a way of life that sustains both the individual and the community.

From these fundamentals we can see that finding a binding between epistemologies and allowing learning to restore the dignity of people and improved understanding of people and their links to the environment is necessary. In the near future it will be increasingly difficult to make people respect nature's nurture and the role of its cosmos. But this won't last because through acceptance of our being as part of nature there shall be more and more people wanting to live in an environmentally friendly place. The future can only improve from learning and understanding the roles ancient and esoteric knowledge helped in shaping the current world view. May we, after mastering how to be destructive, never teach the next generation to be the idiots that we may have been when ignoring the destruction of Mother Earth and her care for us to date.

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Preparing for a Changing Environment: Using Scenarios for Environmental Education

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Abstract
Scenarios are powerful tools for stimulating creative thinking about the future. Scenarios are especially valuable for planning and decision-making in complex and uncertain circumstances. This paper presents how Scenarios and Visioning are useful tools for environmental education, in particularly for changing environments (social and biophysical). We first outline the Scenarios methodology. We then present lessons learnt from applying Scenarios to environmental education with children and youth in Peru. We conclude with an analysis of the benefits and challenges of using scenarios for environmental education to achieve environmental awareness objectives.

Introduction

The magnitude and location of environmental changes, such as the effects of climate change on particular regions of the world, or exactly how much sea levels will rise, remains in many cases uncertain (Schiermeier, 2007). UNESCO (2002) recognised the importance of building the capacity for futures-oriented thinking as a key task of education.

Scenarios are creative answers to the question: "What if...?" in the form of narratives about the future. These stories consider a range of changes (expected or unexpected) that may occur and their potential impacts and they follow a consistent and realistic logical framework. Scenarios can also take the form of technical models, maps or theatre. Scenarios are particularly valuable for planning and decision-making in complex and uncertain circumstances and in situations where changes are occurring beyond the control of a community (Evans et al., 2006). The outputs of Scenarios can be quantitative, qualitative, or some mixture of the two. By stimulating creative ways of futures-oriented thinking, scenarios help in making decisions today.

Other techniques can be used with Scenarios that guide communities to think about their future. Visioning is an empowering method for communities to take command of their future by deciding how they wish it to be in their own terms. It is a process where people share their expectations and reach consensus about an ideal future by reflecting critically on it (Evans et al., 2006). The vision of the future reflects people's values and assumptions, their biases, their culture, family and their subsequent decision-making and action (Tilbury & Wortman, 2004).

Scenarios have long been used by the business planning sector (Wack, 1985), and together with Visioning, they have more recently been applied to natural resource management planning at different scales, from local to global (see for example, Peterson et al., 2003a,b; Millennium Ecosystem Assessment, 2005; Evans et al., 2006). The value of Scenarios and Visioning has been recognised by environmental education experts around the world (Wisconsin Center for Environmental Education, European Union, 1998; Centre for Environment Education, 2005; Telg, 2000; Tilbury & Cooke, 2005).

This paper presents how Scenarios with Visioning are useful tools for environmental education, particularly when environments (social and biophysical) are changing. It describes the Scenarios and Visioning methodologies and presents lessons learnt from applying them to environmental education with children and youth in Peru. The authors conclude with a discussion and analysis of the benefits and challenges of using scenarios for environmental education in reaching environmental awareness objectives.

Scenarios and Visioning methodologies
Scenarios

Scenarios methodology (Box 1) is flexible and can be adapted to suit specific needs of the participants, varied objectives or physical and/or methodological constraints. During a Scenarios exercise, participants identify historical eras of change and renewal (step 1) using a timeline. This allows them to identify key past eras and trends. Then, they discuss current issues. These issues are the "focal questions" (step 2) and identify driving forces (step 3) or change factors that influence the community. Role play has proved to be a valuable tool in motivating exchange of ideas, levels of abstraction and reflection and to start the scenarios discussions (Lopez et al., 2006; Prieto et al., 2006).

After two or three key driving forces are identified, they can serve as starting points (step 4) for constructing the scenarios narratives (step 5). These narratives should be plausible and answer the "what if..." questions. Once the narratives are ready, participants discuss among different groups (step 6) and refine their stories, adding shocks or surprises and analyse their impacts in terms of "opportunities and threats" and plan how they can best prepare for each scenario (step 7).

Visioning

By using Visioning (Box 2), participants come up with one image or description of their desired future, unlike Scenarios, where the output is more than one

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Step 1: Identify historical eras of change and renewal
By using a timeline that goes as far back as possible, participants identify key eras and trends, discuss changes and identify the forces that drive these changes.

Step 2: Identify the focal questions
The focal questions are the main concerns or topics of the Scenarios exercise. Participants discuss: *"What are your main questions about the future related to (topic of the exercise)?"*

Step 3: Identify driving forces
Examples of driving forces are new government policies, environmental changes, ethnic conflicts, market price shifts, health problems, roads, etc. Participants review the list of driving forces identified and classify each of them as "Certain" or "Uncertain" and "within control" or "beyond the control" of the community.

Step 4: Define the starting points
This step creates the opening sentences of the scenarios. It is the equivalent of saying: "Once upon a time… (fill in with starting points)". Changes in driving forces can be used as starting points for the scenarios.

Step 5: Create narratives
Participants use the starting points to weave rich, coherent, plausible narratives. They can use a timeline to represent how the different drivers will play out. Alternatively, they can use "what if…" questions to deepen the stories.

Step 6: Present and discuss
The participants present their scenarios and discuss the implications in terms of "winners and losers" and changes in their communities.

Step 7: Refine the narratives and analyse impacts
Participants refine their scenario narratives based on the feedback and check for consistency and plausibility. A shock or surprise can be introduced into the scenario and the group discusses how the community can adapt. After the groups have refined the narratives, they discuss the impacts of their scenarios and how they can prepare for each in terms of opportunities and threats.

Box 1. Scenarios steps

future. During Visioning, the participants discuss today's concerns and decide on the time frame, this means, how far in the future they want to look at (step 1). Then, using different techniques such as "a walk in the future", "guided vision", or "building on the best", individual participants develop key elements of their vision of the future (step 2). Next, each break-out group comes up with their own vision, building on individuals' contributions to the discussions. This could be done as a drawing or a story as a group (step 3). Finally, each group presents their vision and they discuss and rank key elements of each vision in plenary.

Scenarios and Visioning applications for environmental education
Environmental education relates largely to concerns about the future – to the extent that if communities do not consider the way the environment is managed in the present, the future may be projected to be correspondingly gloomy. The Brundtland Commission stressed that sustainable development is a process of change with the future in mind: "A process […] where the exploitation of resources, the orientation of technological development and institutional change, are made consistent with future as well as present needs." (World Commission on Environment and

Development, 1987, p. 9).

Insights into young people's views of the future have emerged from studies utilising a variety of methods including questionnaire surveys, qualitative interviewing and analysis of children's drawings. From all of these studies it is clear that young people hold, and are able to express, a variety of concerns and ideas relating to the future. Findings about the nature and depth of such concerns, however, differ between studies: some reporting definite pessimism and cynicism about the future, while others, more positive futures (Rickinson, 2001). This variation could be due to the fact that such studies have not taken into account the fact that young people are able to conceptualise different scenarios for their future.

The concept of "alternative futures" has been widely explored (Shane, 1973) in environmental education practices. An alternative futures model will identify the directions in which current trends are leading, but it then asks questions like "What changes in our existing planning will change these trends, and in what ways?". Use of the computer as a data processor can speed up the development of alternative futures models by allowing for the rapid manipulation of massive amounts of data.

Following are lessons learnt from applying Scenarios and Visioning to environmental education with children and youth in two different environmental, social and economic contexts and with similar environmental awareness objectives in Peru (see Table 1).

Table 1. Comparison of key statistics of the Scenarios and Visioning exercises

Participants and Location	Participants' age range	Number of participants	Female participation	Duration of exercise
Students high school, Piura, Peru	11-13	25	40%	1 day
Technicians, Piura, Peru	18-25	22	36%	1 day
Students universities and technical institutes, Puerto Maldonado, Peru	17-26	28	57%	2 days

Case 1: The Chalaco sub-watershed and the Sustainable Development Mountain Ecosystem Programme in Peru (PDSEMP)

The Sustainable Development Mountain Ecosystem Programme (PDSEMP in Spanish) was established to contribute to natural resource management of the Chalaco sub-watershed in Northern Peru through an environmental management program. Chalaco is a rural district located in the highest part of its watershed. It influences the water regime and has unique forests of high biological and ecological importance. Its inhabitants are worried about conserving these ecosystems because their livelihood depends on them (Lopez et al., 2006). 80% of the natural forest of the watershed is deforested (PDSEMP home page, http://www.udep.edu.pe/programachalaco)

The population lacks access to basic health services, suffers from malnutrition, and has poor quality education with limited access to information outside the community. Most economic activities are subsistence-oriented and in general the population has little entrepreneurial experience. The closest town with all basic infrastructure (water, health, market, information and education) available is five

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Step 1: Decide timeframe and discuss today's concerns
Discuss the timeframe for the vision. The number of years will depend on the context and application. For example, the local government may use a 5-year planning cycle, or a community may be planning for a development project (new roads, housing development or waste management). It may be more useful to imagine even further into the future or within a smaller time span.

Step 2: Develop the vision of the future
These are three suggested options for building a vision of the future.
Option 1: A walk in the future - Request that participants relax, close their eyes, and clear their minds. Start them on an imaginary trip into the future. Now lead the group in a walk around the community. Stop at specific points in and around the community, such as the stream, well, road, school, agricultural areas, and houses and ask them to describe what they "see" in the ideal future.
Option 2: Guided vision - This approach is ideal if the exercise is not taking place near the community. Request that participants sit quietly, relax, close their eyes, and clear their minds and imagine the community in say, 20 years time and ask questions about how exactly it looks. After fifteen or twenty minutes of imagining, the participants open their eyes and write down or draw the things that stood out most in their vision.
Option 3: Building on the best - If participants already followed the Scenarios steps, they can use these as a starting point for the Visioning exercise. Ask the participants to present their scenarios and identify all of the positive aspects. Break into small discussion groups, and have the participants discuss those positive aspects or qualities. Then ask them to think about an ideal future based on those aspects. Some things might not be possible or make sense when put together. The participants should discuss these issues and decide what aspects to keep.

Step 3: Drawing tomorrow's vision
After developing their vision, participants return to the workspace and draw or write down their desired vision in small groups. This step is best done without facilitation, allowing the participants to organise themselves and decide how they will complete the task.

Step 4: Presenting, discussing, and ranking
The break-out groups go back to the workspace and display all of the visions on the wall. Each group presents its work. Then the entire group discusses and compares their visions. After the group discussion, the facilitator posts the list of ideas on the wall to vote on them. This activity requires that the participants share their ideas, understand the concerns and visions of the other participants, and prioritise them together to arrive at a consensus. It also gives an equal voice to all participants.

Box 2. Visioning steps

hours away by road. On the other hand, there is a great interest in how the community mobilises itself, particularly women's groups.

In this context, Scenarios exercises were developed with two groups. The main objective was to reflect on future changes in Chalaco's environment and to raise awareness on the role of its population in the conservation of the mountain ecosystems. The first group consisted of 25 secondary school students, 40% female, age ranged between 11 to 13 years. The second group consisted of 22 villagers, technical students and technicians from the PDSEMP, 36% female, age ranged between 18 to 25 years. Each group was divided into four break-out groups who developed and presented their final scenarios to each other in plenary. The exercises and other planning activities have helped refine the PDSEMP. Initially the PDSEMP focused on broader activities dealing with the environment but soon realised that there is a need for more focused projects such as reforestation projects, a producers' organisation and marketing linkages and improvement of water use (Lopez, personal communication, 2006).

Lessons Learned from Applying Scenarios and Visioning in Chalaco

The first lesson learnt relevant to Environmental Education is simplicity. Originally, the facilitators followed the Scenarios methodology using a structured time line exploring scenarios for the next 5 and 10 years for Chalaco but this proved to be challenging since the children involved did not have the perceptive ability to think about a 5 and 10 year time lapse. The facilitators focused on Visioning during the smaller group sessions, which led to drawings or narrative stories as outputs but allowed the groups to gain an understanding of futures thinking in a more unstructured manner. Facilitators used the analogy of the making of the movie, where in daily life everybody was an actor and the setting was the watershed. Facilitators explained that although the story of the movie continues to unfold through the actions of the various members of the communities (the actors), the ending will depend on the collective decisions that are made today.

The second lesson relates to socio-cultural issues and authoritarian schooling. It was very challenging for students to separate the concept of grading from creative activities even in extra-curricular settings. For example, one of the children in the break-out groups worked in a separate room, when a second group got in to share the same space; the first group got distracted and started comparing its work with the incoming group, in terms of whose drawing (Visioning output) was better or worse. Conveying the message that drawing is a way of thinking about the future and not a competition among the different groups was an important message to convey. Moreover, one of the participants insisted on a negative scenario and he was vetted by the group who preferred a positive only scenario. In the students' view, a positive

scenario is "good" and will please the authority figure (in this case, the facilitator).

A third lesson relates to the level of critical analysis. A deeper level of analysis (time line with two year intervals) was only possible with the older groups. In some cases, the scenarios presented by the children included unrealistic aspects in them, probably reflecting their good will. In the case of youth, making the connection between the Scenarios and Visions with the objectives of the PDSEMP project was helpful for the participants to realise the importance of planning for the future, which coincides with the project's strategic planning work, e.g. strategic development plan for the district, natural resource management plan and micro-watershed plan.

Case 2: Youth from Madre de Dios region in the Amazon of Peru

Madre de Dios is located in South-eastern Peru and is currently the least developed area of the country. The main economic activities of the region are logging, gold dredging, Brazil-nut collecting, eco-tourism and other forest extraction activities. The climate is tropical, hot and humid most of the year and its altitude is 230m. The capital city of Madre de Dios is Puerto Maldonado, founded originally for the collection of wild rubber in 1902, next to Tambopata and Madre de Dios rivers. Madre de Dios' national parks and reserves are located on the Tropical Andes Biodiversity hotspot (Conservation International).

Road construction and improvement in the Amazon has been a regional dream for Peru, Brazil and Bolivia (Brown et al., 2002; Nepstad et al. 2001). This dream is becoming a reality by paving the road between Brazil and Peru. The completion of this project will have important, if unpredictable, implications for the socio-economic development of the area particularly as it has taken place in the context of a recently signed free trade agreement between Peru and the MERCOSUR (Southern Common Market) countries. The Scenarios exercise was conducted in 2005, at a time where many cross-boundary changes were taking place, including regional integration, large-scale infrastructure development, and improvement of communication links. These changes were associated with management of the natural resources and increasing economic differentiation and concentration of wealth.

The two-day Scenarios exercise involved 28 university and technical students living in the city of Puerto Maldonado, 57% female participants of 17-26 years in four break-out groups. The objective was to understand their opinions about the future of the region and to explore and raise awareness on the environmental, social and economic implications of the paving of the new inter-oceanic road that connects the Amazon of Brazil and Peru, crossing biodiversity hotspots areas.

Lessons Learnt From Using Scenarios and Visioning in Puerto Maldonado

In this case, facilitators used different approaches to applying Scenarios. First, there was a short "registration survey". The answers to this survey provided useful insights into the initial perceptions of participants prior to the workshop. The survey questions enquired about the past of the region, the potential impact of the transoceanic highway and the future of the region in 20 years.

Second, the facilitators stressed the importance of coming up with clear focal questions and identification of driving forces or change factors. Third, the output of the Scenarios exercise was two scenarios from each break-out group, one positive and one negative. The main reason for choosing this approach instead of the time line method was the lack of time. The late arrival of many of the participants and the time spent defining characters for role-playing took longer than planned and hence significantly delayed the process. Therefore, the first lesson learnt from this exercise is adaptability. The Scenarios is a flexible tool and can be adapted to suit specific needs.

A second lesson learnt is the key role of the facilitator. Although the level of analysis and reflection from the participants was mixed, the facilitators had to find the best way to stimulate reflection in order to reach to conclusions about the Scenarios by encouraging active participation, for example, involving more proactively the quiet participants and moderating the very talkative ones. The facilitators needed an in-depth knowledge of the Scenarios methodology and to be familiar with the history of the region, as well as its problems.

A third lesson is the importance of monitoring. A four-question survey was carried out and the results were very positive, receiving high rates from participants (more than 80%):

- Scenarios were perceived as a tool for group planning (83.5%).
- Participants reflected on the future of Madre de Dios, particularly with regards to the impact of the Peru-Brazil highway (90%).
- Participants learnt something new about the history of Madre de Dios and the projects that are taking place in relation to the future of the region (80.4%).

In general, the participants liked the Scenarios methodology because it prepared them to face the future with the foundation for a plan of action. The Scenarios exercise allowed them to learn the history and reflect on the future of their region.

Finally, the mix of participants will determine the richness of the Scenarios. Since participating in the Scenarios exercise was a volunteer/extra-curricular activity, only those who are curious about the topic, concerned or interested attended. Not surprisingly, most of the participants were students of forestry, ecotourism and agro-industries.

Conclusions

Scenarios and Visioning have proved to be useful for children and youth to motivate them to think critically about the future. The Scenarios and Visioning exercises accomplished their objective of raising awareness of building the future of Chalaco and in Puerto Maldonado. They helped the children and youth to think systematically about uncertainties and how to deal with them.

Scenarios and Visioning approaches should consider the cultural and social context of the application such as the influence of authority (formal educational grading systems), the level of critical analysis and participants' social, economic, cultural and educational backgrounds. Hence it is important to have the right mix of people to build the Scenarios. For younger children, answers they provide may be heavily influenced by those around them (especially parents and older siblings) and therefore developing activities around decision-making in the household, may provide further insight.

Appropriate facilitation in all Scenarios and Visioning is necessary for conveying the approach clearly, without compromising the details in the methodology. There is a certain level of complexity involved in the approaches that the facilitator should fully understand.

The main benefits of the Scenarios and Visioning methodologies include:

- Flexibility: Can be adapted to the local resources available, it does not need to be an expensive exercise.
- Adaptability: Can help to develop planning capacity along with long-term thinking. The strategies could work in two or more alternative futures; therefore, they have a greater chance of succeeding than strategies that are based on only one kind of possible future.
- Investment in long-term benefits: increased capacity of forward looking, planning and critical thinking.
- Awareness of roles in communities: Participants gain a sense of their roles and others in their communities in shaping their future and the actions needed to make it happen.
- Community Ownership: Creating their own vision of their future provides them with tools for monitoring their own progress.
- Identification of underlying socio-cultural values: Key driving forces or factors that bring about different types of change are identified in the assessment of different futures.

Scenarios and Visioning have proved useful for environmental education because they make participants feel responsible and empowered to adapt to changing environments or to take action to reach their vision for a better community by raising their awareness of environmental issues. These tools can be adapted to formal or informal settings, different target groups, by age, gender, socio-economic and geographical contexts.

The application of these methodologies contributes to understanding further the biophysical and socio-economic forces behind environmental changes and facilitates the creation of collaborative strategies for adaptation and mitigation of these changes for the betterment of future generations.

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Project-based learning: Nile basin Transboundary Experience

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Abstract

Project-based learning has been used as a tool in enhancing learning, especially in environmental subjects. The model has been tested by several organisations, GLOBE, iEARN and Eco-Schools to mention a few. Within the Nile basin, the transboundary environmental project has introduced the project-based learning model which uses physical school projects as laboratories for students and communities around the school. This paper shares the experience in implementing the model in Kenya through projects within schools, training of teachers and the benefits of involving communities in project implementation. The paper also discusses the challenges and lessons learnt for wider application.

Project-based Learning (PBL)

Project-based learning (PBL) has been used as a teaching model for enhancing learning in schools. Academic research supports the use of project-based learning as a way to engage students, boost cooperative learning skills and improve test scores (Thomas, 2000). It is an authentic instructional model in which students plan, implement, and evaluate projects that have real-world application beyond the class-room (Blank, 1997; Dickson et al., 1998; Harwell, 1997). It emphasises learning activities that are interdisciplinary, longterm and student-centred (Challenge 2000 Multimedia Project, 1999). Project-based learning is a potentially effective teaching approach for the 21st century that can be used to facilitate education for a sustainable future.

PBL is widely implemented using different approaches around the world. For example, through the Foundation for Environmental Education (FEE), Eco-Schools' environmental action learning approach promotes putting the local environment, action and learning at the centre of education to enhance sustainable lifestyles. It utilises micro-projects as learning aids and as linkages for dynamic community partnerships and networks (Eco-Schools, 2007). The Global Learning and Observation to Benefit the Environment (GLOBE) approach is inquiry-based, where students take measurements in their local environment, report observations via internet, use resources already in the database and conduct real research in collaboration with different groups around the world (GLOBE, 2007).

Using Projects as part of the curriculum is not a new concept; teachers often incorporate projects into their lesson plans. However, integrating physical projects as a mainstream teaching method that ties curriculum competencies with real world skills that students require for a lifetime is a new teaching paradigm embracing the belief that children learn best by applying concepts to real-world scenarios. A project is an authentic performance-assessment task in which students must apply the knowledge and skills learned in class to solve a genuine problem outside the classroom (Reeder, 2006). It is through this process that the learners gain understanding and assimilation of the lessons being learned, and retain the understanding of that lesson at a higher rate than traditional classroom, single topic instruction.

Environmental Education within Kenyan Schools

The natural resource base in Kenya is shrinking rapidly and environmental threats are becoming increasingly severe, pushing the country into poverty and associated environmental problems. These resources cannot be guaranteed for future generations in the same quantities and quality (NEMA, 2004). Environmental Education in Kenya has not adequately addressed these threats to the environment despite the fact that mainstreaming of environmental issues in the curriculum at primary and secondary schools levels dates back to the colonial days (before 1963). At early childhood education level, EE is integrated in the curriculum using a thematic approach. At primary and secondary level, environmental issues are mainstreamed in the existing subjects using a multidisciplinary approach. All teacher-training colleges currently offer courses in EE. The same applies to universities where faculties/departments of environmental studies exist (NTEAP, 2005).

EE in its traditional forms is limited in meeting the immense challenges posed by unsustainable patterns of development. A transformative educational experience is essential in creating the shift in thinking and action necessary for a healthy, just and environmentally sustainable society. Reorienting existing educational programmes is one of the key domains of the United Nations Decade of Education for Sustainable Development (UNDESD). The National Environmental Management Authority in Kenya is currently working on the development of a national framework: ESD strategy for Kenya 2005 – 2010, to mainstream ESD in the Kenyan Educational system. The strategy aims to – among others – enhance and support the integration of ESD into all learning programmes, projects and initiatives, and to promote networking and information sharing (NEMA, 2004).

Nile Trans-boundary Environmental Action Project – Schools Projects

The Nile Basin Initiative (NBI) is a transitional mechanism that includes the ten Nile riparian countries[14] as equal

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[14] The ten Nile Riparian Countries are: Burundi, D. R. Congo, Egypt, Eritrea, Ethiopia, Kenya, Sudan, Rwanda, Tanzania and Uganda.

Box 1: Project Implementation

Forest conservation

In Trans-Nzoia, Rift Valley Province, farmers are clearing tree cover to make way for agricultural expansion for livelihood improvement. St Joseph's Boys' Secondary School started an Apiary management project to demonstrate how farmers can raise income while maintaining tree cover. Through the NTEAP project, the club bought 14 bee hives and a centrifuge to process the honey. The learners also planted trees and sunflowers to increase the tree cover and forage for bees.

In Rachuonyo, Nyanza Province, community demand for fuel wood has denuded the land of tree cover. Ngeta Mixed Secondary School and Omuga Primary School raised tree nurseries to promote reforestation within their neighbourhood. The tree nurseries have provided seedlings for planting within the school compound and at the learners' homes. Selling of seedlings to the community members and donations for planting in public places has increased tree cover.

Waste Recycling

Around Bishop Atundo Primary School, plastics, papers and leaves littered their surroundings and so the community started a waste recycling project to demonstrate a cleaner environment and usefulness of recycled waste material. They collect and separate waste, make compost from bio-degradable material, collect plastics for resale, and make briquettes for cooking from waste paper and leaves. They demonstrate the use of compost in the tree nursery and in the school kitchen garden, where they grow vegetables and sweet potatoes to provide school lunches that are cooked using the briquettes.

Siria High School, located in a pastoralist community in the Mara area, selected to demonstrate the use of animal waste to produce biogas. The school and parents contributed the cows while NTEAP supported the construction of the biogas unit. The project has demonstrated an alternative source of energy that saves on fuel wood. The school is saving money from reduced purchase of fuel wood and LPG gas used in the laboratories. The school will also soon have its first cow calving down and hopes to generate income from the milk and a kitchen garden the students have started, using the sludge from the biogas process.

Soil Erosion Control

Heavy rains in most parts of Western Kenya result in severe soil erosion from surface run off. Kibabii Boys Secondary School and St Brigid's Girls' School used water tanks to harvest rain water from their roofs, thereby reducing the run-off. They also planted trees to hold soil, and constructed soil conservation structures to reduce loss of top soil due to run-off.

Wetland Conservation

Kaimosi Girl's High School is located on the edge of Kakamega forest, a threatened tropical forest, around which the wetlands are viewed as wasteland. The Fisheries Officers provided technical know-how and the community provided labour towards construction of a fish pond in the school. The Lake Basin Development Authority fisheries provided the fingerlings and training to the teachers. What started as a club activity generated a lot of interest and is now a whole school project. The sale of the first catch generated KSh. 45,000 ($640) that the club ploughed back into the project and also used for other club activities such as hosting visiting schools, a community field day, a visit to an agricultural show, and to other fisheries to increase their knowledge and understanding.

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members in a partnership that is guided by the vision "to achieve sustainable socio-economic development through the equitable utilization of, and benefits from, the common Nile basin water resources" (NBI, 2001). The Nile Transboundary Environmental Action Project (NTEAP) is one of the means to achieve this shared vision, through the development of basin-wide frameworks for action to address high priority transboundary environmental issues. The Environmental Education component of NTEAP aims at increasing public awareness of the environmental threats to the Nile environment and their link to community livelihoods, with a view to changing communities' behaviour towards better environmental practices. Activities under this component especially target the future generation in the basin countries, hence the school-based interventions.

Initial Country EE Surveys conducted in 2004 indicated two main constraints: (i) lack of teacher capacity in delivering EE within the set curriculum and (ii) lack of teaching materials (NTEAP, 2005). To address these constraints NTEAP opted to pilot project-based learning on Nile threats in 10 selected schools in each of the Nile Basin Countries. The objective was to create an environment

where students could apply knowledge acquired in the classroom to real life problems affecting their community, thus developing lifelong values and skills for improving environmental conditions, and promoting school-community linkages. This paper shares Kenya's experience in implementing these activities.

NTEAP – PBL EXPERIENCE IN KENYA

Selection of piloting schools

The school selection process was through invitation of the provincial Ministry of Education offices with a view to selecting pilot schools in each province. Several schools responded and started to go through the steps outlined in the concept paper: (i) a school needs assessment was done by the school EE committee comprising teachers, learners, local community members, support staff and parents in collaboration with the Ministry of Education headquarters and NTEAP. It identified environmental resources within the school, threats to the environment and possible solutions. It acted as a starting point for the EE committee to set practical and realisable goals towards solving school and community environmental problems; (ii) development

of proposals based on their findings spelt out the activities, time frame, resources required and the implementation and management strategies; (iii) implementation of activities based on the agreed proposal; and (iv) monitoring throughout implementation and carrying out periodic evaluation to document successes and challenges which can be shared and disseminated.

Project Implementation

Eight schools in the Nile basin in Kenya have started to pilot project-based learning and are at different stages of implementation. The schools implemented projects to address different environmental problems including (i) deforestation, (ii) poor waste disposal; (iii) soil erosion and (iv) wetland degradation (Box 1).

Teachers' Capacity Building

Teacher preparation makes a difference to teachers' effectiveness and is one of the most powerful influences on student achievement (Darling-Hammond, 2001). Teachers need opportunities to talk with other teachers and practitioners to gain a wider exposure to best practices and educational research. To improve teachers' preparedness for PBL, training was organised for two teachers from each participating school. The teachers' training aimed to develop teachers' skills to plan and manage PBL, served to form a national teachers' network for information sharing, and exposed teachers to computer technology in teaching. Resource persons shared PBL concepts and theory,

practitioners shared their experience in using varying models of PBL, and practical sessions provided hands-on trials for the teachers. A Training of Trainers (TOT) approach was used and the trained teachers organised training sessions in their own schools. They were surprised at the number of teachers who joined them in using the project and school compound for teaching.

Environmental Education in Kenyan schools is taught principally through the science subjects. The training gave teachers of non-science subjects a way to customise the current curriculum to include environmental issues. By sharing experiences, teachers from various disciplines have discovered they are working to develop the same competencies, and students now hear the same message from all teachers. Teachers are rearranging their lesson plans to integrate content across subjects and collaborate on projects.

Since PBL sets students to work on their own steam, as self-directed learners, the skills acquired in the training sharpened teachers' ability to facilitate their students to use their individual learning strengths and diverse approaches to learning.

Quality teaching is defined as a teacher in every classroom who has a gift for designing learning experiences that engage young people and successfully communicate information and skills (Hart & Teeter, 2002). The trained teachers report that

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Box 2: Teachers' Capacity Building

Teachers in Kaimosi Girls' High School have been looking for ways to make learning exciting, and the concepts shared by their colleagues trained by NTEAP were an answer to this quest. Mr Wabwire, the project coordinator, reports that the teachers were very receptive and those who have used the PBL methodology say they are able to introduce different learning opportunities in the classroom and this has made the classes lively and learner-centred. The teachers meet and discuss how they can improve their teaching effectiveness using the project. They visit other school teachers trained by NTEAP to learn from them how they are covering different topics using the PBL model. Mr Wabwire travelled to Egypt, at the invitation of a teacher there, to learn, exchange ideas and share the same with his colleagues. The school principal is very supportive and this has made it possible for the teachers to allocate time needed for staff meetings to share ideas and discuss problems. Because of this support, teachers are more enthusiastic about trying out the new strategies.

Mrs Odhiambo, an English teacher at Ngeta Mixed Secondary School, has always been interested in participating in activities to improve the environment. Until the training, she had no idea how to integrate environmental issues into her teaching. The training was an eye-opener, enabled her deeper thinking and sharpened her creativity in lesson planning. Now she can include environment-related examples in several English lessons.

To teach the learners in St Joseph's Boy's Secondary School the topic of beekeeping, Mr Lukorito decided to move away from conventional approaches. He used a video recording, which he showed in class, then took the students to the project site where they received an explanation from a student club member about managing a beekeeping project. The students were then asked to make notes which he assessed. He noted the differences in what each student learnt and how they expressed it; this for him was a learning experience. He learnt that PBL makes a difference.

Mr Kisira teaches Biology and Chemistry at Siria High school. He used the skills acquired during training to refocus his lesson plans on fermentation in biology to include the use of the biogas project as a laboratory. During this lesson, the students were very active, asking questions, participating in the discussion and it was the most interactive class he has had since he started teaching. At the end of the school term, examination questions on fermentation were answered better than those in other topics. He is now doing the same for all other topics in the subjects he teaches.

In Kibabii Boys, Mrs Kasavuli reports that there is 100% participation from the students when PBL is used, and the lessons are more learner-centred than before.

Box 3: Students' learning experiences

In Bishop Atundo Primary School, the waste recycling project has been used as a teaching aid and science is now a favourite subject across the school and the learners' grades have improved in the subject. The learners' self-esteem has been boosted and presentation skills sharpened by giving them an opportunity to teach others about what they are doing on the projects, and sharing the same information with their parents and neighbours. Learners also learn key skills in conservation farming, composting, mulching as they work on the project. Their handiwork results in fresh vegetables and sweet potatoes, showing them they can make an impact in the world. Learners selected the project ideas they most liked and started the same at their homes. The parents of Edith (Std 7) and Dennis (Std 5) now boast a flourishing kitchen garden started by their children using compost made at home, while Samuel and Faith's (Std 7) parents have a tree nursery from which they can sell seedlings to their neighbours.

Learners and teachers in St Joseph's Boys Secondary School were not deterred by lack of time allocation in the regular timetable and made time after school and on weekends to do project work. Their enthusiasm was infectious and resulted in an increased enrolment in the club, while other teachers, who were not club patrons, joined the students during club time to learn about the project and how they could use it.

A teacher in Ngeta Mixed Secondary School said that it was a strange but exciting experience for the learners as teachers developed hands-on activities at the tree nursery for the learners to actively participate in the learning process. For an English composition lesson, learners were taken to the project site where an environmental club member in their class explained to her classmates the procedure from seedbed preparation, planting of the seeds, through to transplanting of the tree seedlings, the class was then asked to write a descriptive essay on raising tree seedlings. After the English lesson, one Form Two student had this to say: "I thought this project was for the club members, I am amazed it can be used to teach English composition, I will never forget these stages".

The learners of Siria High School have demonstrated a proactive response to another environmental problem affecting their community and initiated activities to sensitise the community on effects of mercury to users and animals. Mercury is widely used in gold extraction in the community. The journalism club has written letters to the local administration to address issues of land degradation as a result of gold mining and one class has started a multipurpose tree nursery to produce seedlings for their school forest and the community to preserve biodiversity.

In Kaimosi Girls' High School, the learners use one assembly every week for learners and staff to share information on different environmental issues within the school. In Ngeta Mixed Secondary School, the learners organised talks both in and out of school to talk about selected issues with the local community.

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using these new techniques has helped motivate learners and stimulate their interest in subjects. Teachers' responsiveness to their learners' needs has improved, and the relevance of the subject content to the learners is understood since they can relate to the examples given. Teachers report that their teaching is therefore more effective.

Physical projects as learning resources

Research has shown that students retain more knowledge and skills when engaged in stimulating projects. They use higher order thinking skills rather than memorising facts in an isolated context without a connection to how and where they are used in the real world (Blank, 1997; Bottoms & Webb, 1998). In the participating schools this has been found to be true; teachers have reported changes in their learners' response to learning. Learners are more inquisitive, interested and appear to enjoy the classes.

The school system in Kenya is examinations-oriented, and the projects, which are categorised as co-curricula activities, are only allocated a 40 minute class. This time is inadequate for the work required on the project. The interest generated by the project to enhance learning made learners and teachers allocate their free time to work on the project. This has provided an opportunity for learners from different classes to work together, and teachers to discuss and design cross-curriculum aspects and uses of the project.

Many of the teachers have used the project as a learning

aid across subjects and found that it stimulated learners and helped them retain more content and acquire new skills they would not otherwise have acquired. Students are also using other parts of the school compound to demonstrate learnt skills or as practical material to support theory lessons.

Other than lessons being more interesting and learners showing better retention, these projects have also empowered learners to identify problems in their surroundings and take action to resolve them. Teachers have used this to evaluate their learners' progress, since the learners reflect on what they have learnt, synthesise the knowledge and use this to come up with the subject for the next activity. These initiatives have worked to maintain the profile and momentum of PBL in the school by having a number of projects running consecutively.

When children observe that home and school are engaged in a respectful partnership for their benefit, they are likely to develop more positive attitudes about school and achieve more, compared to situations in which school and home are seen as being worlds apart (Comer & Haynes, 2007). Reports from the teachers indicate that learners have become more animated at home about what they're learning in school and are experimenting with the project ideas at home. The results of their work speak eloquently about the good things going on at the school. The learners have reported that their parents and

community members, who are subject-matter experts and/or consumers of learners' products and performance, have become partners in their education and support their experimentation at home.

The schools have reported that the entire school has taken on a *palpable* hum of productive effort, learning feels less forced and more about the joy of doing something useful. Increased group work in PBL is teaching the learners to collaborate effectively, a skill they require as future managers and leaders. Embedding examples of real life situations into core academic courses has provided an interdisciplinary way of learning that is more meaningful and will help learners make better decisions. As learners learn better, from more hands-on lessons, they are getting lifelong skills, a change in attitude and perceptions that will help them to minimise their adverse ecological footprints. The learners will bring their knowledge, skills and values to their future employment, consumption decisions, lifestyle choices and to the improvement of communities in which they live.

Community Linkages

The local communities around schools in Kenya are usually disconnected from the schools. The low level of community involvement has been attributed to a less than welcoming atmosphere, language and cultural barriers, insufficient training for teachers and lack of community education. There was a need to do something differently, to connect to the community, since school-community

linkages are important in creating a good working environment between the school and the local community that will facilitate their contribution to the development of the school. NTEAP's school-community linkage aimed to promote collaborative efforts in solving common problems, while building community capacity to address environmental threats.

Each school selected the best approach to achieve these linkages other than the one introduced by NTEAP that required a participatory project development process. Schools have used the contact farmer approach, outreach approach and open/parents days to reach out to the community. They have reported a very good response from the community which is eager to learn and share their experience with the students and teachers.

Community members and parents have shown great interest in getting involved in the schools' environmental activities and are contributing resources in cash and kind, while learning new skills. The local community also supports the project by buying their produce, either seedlings or vegetables.

The school administration is more sensitised to the need to strengthen community linkages and allow their learners to participate in environmental activities organised by the community, and include the community in activities organised by the school. They have learnt that the approach to community engagement is much more than a

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Box 4: School-Community linkage experiences

St Joseph's Boys' High School is using teachers living outside the school compound to contact farmers and have reported providing information to ten farmers interested in starting their own apiary.

Ngeta Mixed Secondary Sschool's environmental club used an outreach approach with learners and staff giving talks to neighbouring schools, women's groups and CBOs in the area as part of their club activities. This has prompted a local non-governmental organisation, Kamsar B women's group, to use the school nursery as a demonstration site for their members and other community groups. On 22nd February 2007, to celebrate Nile Day, learners and teachers joined hands with community members and learners from a neighbouring primary school to plant trees at their school and at a proposed site for the local dispensary.

The open/parents day used by Kaimosi Girls' High School inspired a community member living next to the school to start a fishpond on his farm. A university also sent its students to carry out research at this project, and purchased fingerlings to stock their own fish ponds. These interactions have served to expose the school community to varied aspects of fish farming, indigenous knowledge and wetland conservation strategies. The Government Fisheries Officer uses the project at the school to train farmers. This, he says, has gone a long way to interest the community in starting fish farming as an income-generating activity.

In Siria High School, the community collects and brings to the school cow-dung to fill the bio-gas digester. The Livestock Officer in Transmara uses the bio-gas project to educate the local community about waste utilisation. This has improved relations with the neighbouring communities who now see the school as a learning resource.

In Omuga Primary School, engaging the community resulted in tasks being shared out and reduced the time spent by learners to do the physical work. The community can also benefit from the clean water brought to the school since the children carry water home after school to minimise time used to go to the river after school.

In St Brigid's Girls' School, the solution to their erosion problem required the whole community to carry out the same measures to ensure a lasting solution. Through the local administration, the school called all their neighbours to discuss the solution and invite them to participate. This has proved to be a lengthy process and a practice of patience in the hunt for the common ground which can provide the basis for productive collaboration. The school administration, staff and students have focused on building trust, respect and to address community needs. They are getting lessons in conflict resolution and have embraced a philosophy of partnership in which responsibilities are shared.

quick fix of a couple of private meetings attended by a few well-connected stakeholders. It needs to involve community members in a sustained effort to design and implement a plan of action that addresses common issues between the school and community. Through the NTEAP activity, schools are working on establishing sustainable linkages.

The NSTEP-PBL Model is a vehicle for communicating and harmonising interventions undertaken by schools and communities to improve and facilitate school-community relationships and collaboration, while encouraging schools themselves to become communities of learners. By working together as full partners, an educational experience has been created that is addressing common problems in the school and the community. Further, the school-community partnerships established have enhanced the sharing of resources, knowledge and skills. The schools are seen as centres of learning for both the learners and the community and an important demonstration of ways to achieve environmentally responsible living and to reinforce desired values and behaviour in the whole community. The community is more willing to contribute to school activities and this has provided another avenue for them to participate in their children's education.

Lessons learnt and Conclusion
For two years the selected eight schools in Kenya have been going through the stages to fully implement PBL. The experiences shared in this paper indicate that the physical projects are serving their intended purposes of demonstrating good environmental practices, providing teaching/learning resources both for the school and the wider community, while creating income-generating opportunities for the school. The process of developing and implementing the projects through an all-inclusive committee has promoted participatory decision making, provided a framework for learning about the key environmental issues in the school's locality, and developed positive attitudes, commitment and active participation in resolving environmental problems. Teacher training has equipped teachers to continue using the model over a long time, thus promoting the sustainability of PBL.

Incorporating the Ministry of Education headquarters from the start was very useful in facilitating entry into the school system.   At the school level, the NSTEP-PBL model focused on teachers as the entry point since they are the implementers of PBL. However, it takes dogged commitment to building resources, in terms of both budget and time, a staff willing to invest several years in focused curriculum and professional development, and a clarity of vision to sustain PBL. Teachers therefore require

the enthusiasm and backing of the school principals. Our experience shows that schools with supportive principals are moving a lot faster than the others and feeling free to experiment with the model. There is need to pay more attention to securing the understanding and support of school principals at the start of the project.

A strong system of education that allows all students to reach their potential is possible when schools and communities work together. Fostering ties with other learning institutions, non-governmental organisations, practitioners and learners' families, the PBL model provided the school with access to support agencies and a strategy that benefits parents, learners and ultimately the entire school community. Although such partnerships are difficult and require all parties to move out of their comfort zones, they provide the greater hope for deep and lasting changes in our schools.

Like any demanding but worthwhile achievement, development of an individual teacher's ability to employ PBL effectively or create a school-wide PBL instruction program takes time and stamina. It requires overcoming resistance and finding ways around obstacles. It needs thoughtful plans of action and evaluation, and a great deal of wisdom about pacing the change. This is why it is necessary to emphasise well-implemented, standards-focused, academically rigorous project-based learning, which is a challenge. In Kenya, curriculum development is centralised and viewed as the domain for the Kenya Institute of Education. To facilitate a structured, widely used strategy for PBL, efforts need to be made to engage policy level support for the introduction of PBL in schools in Kenya.

A sustained, long-term effort to transform education at all levels is critical to the change in mindset necessary to achieve learning in a changing environment. Schools need to lead in this endeavour by exercising their role in training future leaders to face the challenges of an ever-changing world. Considering the existing *'Environmental Crisis',* an education that can develop behaviour and attitudes in individuals so as to act responsibly for the environment is required. It should seek to integrate environmental learning into all aspects of life relevant to the people since lifelong learning is rapidly becoming a requirement for success in the modern world. It is within this premise that NTEAP-PBL operates. It offers vast opportunities for the implementation of ESD strategies in Kenya, and all partners and practitioners need to come together to find ways and means to incorporate PBL into all the school in Kenya.

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Contextualising learning in Primary and Secondary schools using natural resources

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Abstract

New approaches to the contextualisation of teaching and learning using environmental experiences offer encouraging options to improve educational relevance. Natural resource management practices can be used as media for contextualisation and enable learners to cope more effectively with general subject matter, whilst contributing to the skills formation process at the same time. Examples from different parts of the world show that teachers can use natural resources as a learning aid in various subjects and topics as this provides real life examples from the local environment and gives a practical touch to theory. Recommendations are suggested relating to contextualisation using natural resources.

Introduction

The achievement of universal participation in education will depend upon the relevance of education available. Schooling is supposed to help learners develop creatively and emotionally and acquire skills, knowledge, values and attitudes necessary for responsible and productive citizenship. In many countries around the world, the irrelevance of education to the life experience of learners seems to be an enduring problem. Many attempts have been made to adjust educational content so that it becomes relevant to local conditions. In practice, this has often meant the introduction of some 'localised' topics, for example agriculture or environment. Relatively little emphasis has been placed, however, on the development of education strategies that are based on the immediate context in which the school is located. This paper discusses the use of natural resources as a way of making primary and secondary education more relevant to the local situation.

The concept of contextualising teaching and learning using natural resources

Taylor and Mulhall (2001) explored three key learning environments for school-going children: the school, the home and the wider community. These three learning environments are often weakly linked and the experiences gained in each are seldom drawn together and integrated in the learning process. This 'distant' relationship between learning environments is illustrated in Figure 1.

The existence of weak linkages between the three learning environments implies that the experiences gained by learners in school are often perceived to be divorced from life outside school. By maximising the interfaces between learning environments, learning should become more effective (Figure 2).
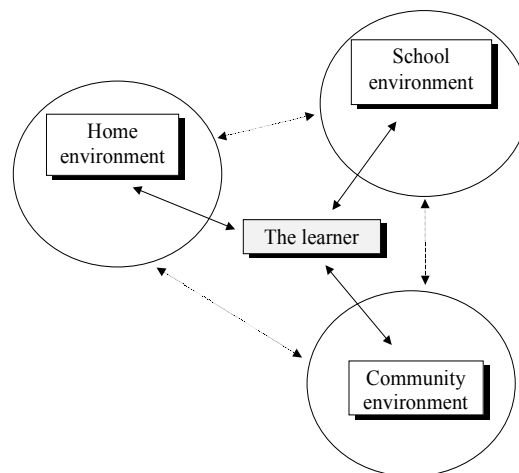
Figure 1: Linkages between school, home and community environments (Taylor & Mulhall, 2001)
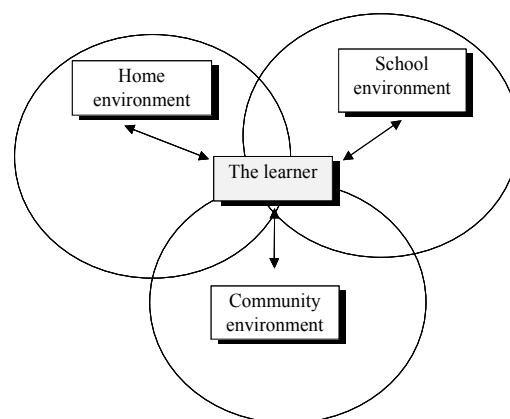
Figure 2: Linking the learning environments (Taylor & Mulhall, 2001)

Contextualisation of learning occurs when the content of the curriculum, and the methods and materials associated with it, are related directly to the experience and environment of the learner. In many schools in developing countries, most learners have direct experience of natural resources, either as a result of their own activities, or from observation in their immediate surroundings. Agricultural or environmental topics used as media for contextualising education can provide avenues through which children can have repeated experiences which help them to master skills. Agriculture and the local environment can be the basis of integrated projects incorporated in the school curriculum, with academic activities chosen for their locally relevant, experimental attributes (Taylor & Mulhall, 2001). An example of this concept is where a local agroforestry tree project is used as the entry point for contextualisation.
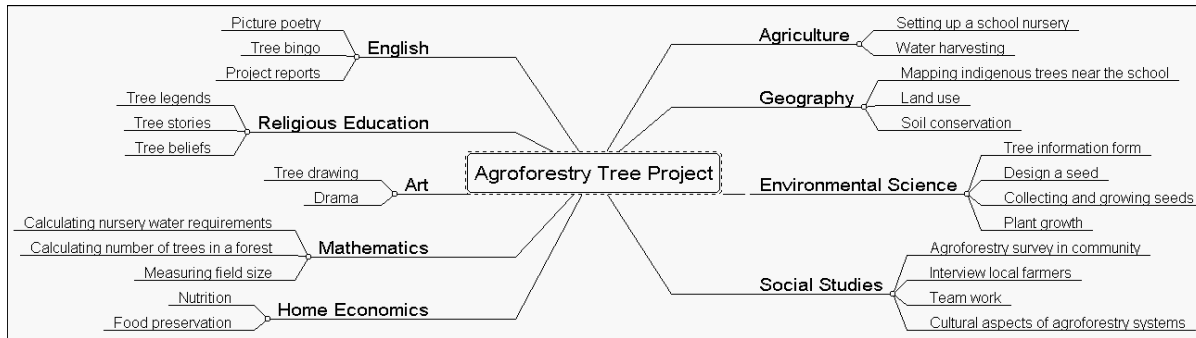
Figure 3: A local agroforestry tree project to integrate the objectives of many subjects (adapted from Action, 1997; Taylor & Mulhall, 2001)

Natural resources offer unique opportunities for contextualising teaching and learning because the concepts can be experienced at school, at home and in the wider community. Thanks to the multi-disciplinarity of natural resources management, scientific, social, economical, political and cultural aspects can be integrated into different subjects and help the integration of disciplines. This can lead to a more effective application of what has been learned.

Contextual learning can serve as a method of combining different subjects into a coherent whole (Balschweid & Thompson, 2000). Bhunu et al. (1999) showed that it is possible to contextualise learning using centralised curricula by teaching in an integrated way where boundaries for subjects are no longer discernible.

Contextualisation, educational relevance and skills development
Contextualisation of content and pedagogy using locally available natural resources offers encouraging options to improve the relevance of education. It can also contribute to the development of skills and competencies, especially in the areas of agricultural production and environmental sustainability. Useful skills in these areas include problem-solving, planning, management, negotiation, facilitation and critical thinking. Not all of these skills will be addressed directly through contextualisation in primary and secondary education, but contextualisation can lay a foundation which will allow these skills to be developed through non-formal, informal and further education. Indeed, qualitative skills reflect more than just formal schooling, and include family input, cultural norms, health and other factors (Hanushek, 2005).

Case studies
There exist several programmes and interventions in different parts of the world that have aimed at the integration of natural resource management in primary and secondary education. Some interesting existing examples are summarised below. The case studies have been chosen because they are all in the field of natural resource management education for children and youth and because they use various approaches. Most of the case studies have made significant progress towards the contextualisation of teaching and learning.

The Lake Victoria Schools Agroforestry & Environmental Education Network
The "Lake Victoria Schools Agroforestry & Environmental Education Network" is a network of primary and secondary schools around Lake Victoria in western Kenya. The network uses natural resources as a way of making teaching and learning more relevant to life in rural areas. This is enhancing the quality of education while at the same time making relevant knowledge and skills available to communities. Each school organises events and activities in response to issues of importance to their learners, institutions and communities.

Activities of the network include in-service teacher training courses, awareness creation with headteachers and district education officers, establishment of micro-projects in schools, organisation of education days, field visits, exchange visits and seminars for students and teachers, competitions in schools in the form of demonstrations, recitals and mural paintings.

Schools have set up a variety of projects related to various aspects of agroforestry and natural resource management, such as tree nurseries, soil conservation and land management, fruit orchards, bee-keeping, tree seed production, medicinal trees and fodder shrubs.

Some schools have set up agroforestry learning resource centres which are accessible information hubs on agroforestry and natural resource management practices, where students, teachers, parents, community members and other visitors can share knowledge and experiences.

A recent study (Kanyi, 2007) on the effects of the network's activities on learners' perceptions of natural resources management concluded that the approach led to positive perceptions of natural resources management among learners. The study also showed that Farmers of the Future is equally benefiting female and male learners.

The 'Landcare in Schools' approach in the Philippines
The 'Landcare in Schools' programme in the Philippines is an example of using agricultural experiences in a way that is innovative, learner-oriented, and strongly linked to the realities of learners, parents and communities (Vandenbosch, 2002).

'Landcare in Schools' is a triadic partnership between teachers, local government units and learners promoting soil and water conservation and agroforestry technologies. Learners are not only being educated on the benefits of the technologies, but are also encouraged to relate what is being taught at school to their home and community context and experiences. This contextualisation of teaching and learning enhances the quality and relevance of education. 'Landcare in Schools' has become a practical learning guide for learners to apply what they have learned in the classroom in actual field activities while sharing it with their families and communities.

'Landcare in Schools' follows two streams of implementation: through integration of agroforestry into existing subjects in the primary and secondary school curricula and as a co-curricular programme for learners in the form of a non-academic club.

Teacher training activities and information and education campaigns are being organised. These include slide shows about the ongoing natural resource degradation, demonstrations on solutions through conservation farming and agroforestry, and training on the roles of pupils, students and teachers in the promotion and adoption of appropriate natural resource management. Training does not only include technical competencies, but also facilitation skills so that teachers are better prepared to address needs in their particular situation.

The response of the schools is tremendous, including the formation of Landcare groups, associations or clubs among students, the establishment of school nurseries for timber and fruit tree seedlings, and the demonstration of conservation farming and agroforestry technologies. School nurseries are being used as learning laboratories. In the 'Trees for Tuition' campaign, parents are encouraged to plant trees on their farms as an investment to be able to pay for the education of their children.

Action: Environmental and health education in southern Africa

Action is a regional environmental and health education project covering Zimbabwe, Zambia, Botswana, Namibia, Lesotho and Swaziland, based in Harare, Zimbabwe. Through the format of a magazine, it researches, develops and publishes education and training materials for children, teachers and their communities. A high priority has been to develop locally relevant education materials with interesting, engaging activities that use available resources. In its efforts to make the magazine issues more accessible to the target group, Action carries out environmental education research, training of teachers on how to use the resources with learners, and has back-up library and documentation services for teachers, researchers, community members and learners (Murray, 1999).

The information in Action magazine is written and pilot-tested with school children and teachers across the region before it is published, making certain that the information is appropriate and interesting. The cooperation of the six Ministries of Education and curriculum development offices makes it easier to develop, test and distribute the material. The topics relate to the dependence of the communities of southern Africa on the natural resources around them. Action's approach to environmental education recognises the inseparability of conservation, rural development, political empowerment and survival; its training programme enhances the work of community-based natural resource management programs.

Surveys and interviews with teachers, learners and distributors indicate that *Action* magazine is a widely read and well-regarded source of information about the environment and health. It is often used instead of a textbook and represents a replicable model for cost-effective curriculum development and international cooperation (Russel & Murray, 1993). One key ingredient of this success is the participation and dialogue with learners and teachers during and after the development of the materials. The magazine itself uses several guidelines: local knowledge is respected; the interests and behaviours of role models are open for discussion; and specific situations are used to introduce the larger context.

REAL Education in Thailand
REAL stands for "Rural Ecology and Agriculture Livelihoods". It is an integrated learning process in which children explore what is happening on local farms, gain an understanding of ecology, and develop critical thinking skills for addressing environmental, health and social problems. REAL is a low-cost approach to integrated learning. The learners' field observations serve as a starting point for learning about a wide range of topics, inspiring lessons in science, mathematics, art and language. In addition, the process of getting learners out of the classroom and into local fields can break down barriers between schools and rural communities and encourage inter-generational learning and enhance the relevance of the curriculum to the needs of rural people. The fields surrounding homes and schools provide children with an ideal place for learning about a wide range of issues (Bartlett & Jatiket, 2004):

- Agricultural fields are a good place for learners to see biological and ecological processes taking place.
- Scientific studies and experiments can be carried out without any expensive equipment, thereby improving the organisational and analytical abilities of students.
- Information that students collect in the field can be used as a basis for integrated learning, bringing together subjects such as science, mathematics, language and art.
- The study of local agriculture is an effective starting point for understanding health and environmental problems such as water pollution, soil erosion and the loss of biodiversity.

- Agriculture brings rural schools into contact with the livelihoods of local people, creating a bridge between teachers, children and parents.

Conclusions and recommendations

Relevant education contributes to development
The relevance of schooling can positively influence productivity. Relevant education, using examples from natural resources management, enables people to live more productive lives and helps to impart life skills which are useful in alleviating poverty and conserving the environment. Efforts to expand education programmes to reach more learners need to be accompanied by measures to ensure that these programmes effectively meet learners' needs. Policymakers and others – including schools and communities – have to seek ways to make the content and approaches of education more meaningful and effective within the local context.

School curricula are often overloaded and leave little room for local interpretation
Curricula, teaching approaches and teaching and learning support materials are not always suited to the local context. Education systems are often centralised and very demanding and leave few opportunities for localised interpretation of the content. Decentralised curricular interpretation and adaptation and contextualisation of contents and methods need to be possible within prescribed national curricula. Initiatives which combine the national common core content and supplementary content based on the local situation need more support. Participatory curriculum development where relevant stakeholders and experts are involved contributes to better curricula.

Teachers are often poorly equipped and need better training
Teachers are the key to effective learning and relevant education of good quality. Unfortunately, teachers are often inadequately prepared, trained, supervised and supported in their work.

Teachers must strive to make education interesting and relevant through the use of appropriate teaching and learning methods and through interpretation of the prescribed curriculum in relation to the local context. Increased efforts to reorient teacher education courses and programmes towards contextualisation of teaching and learning using natural resources can empower teachers to play an important role in making education relevant. Teachers who are allowed and encouraged to participate in decision-making and to treat the curriculum with some flexibility and room for contextualisation are usually better motivated.

Teaching and learning support materials are in many cases inadequate
Even if teachers are competent and well trained, they often find it difficult to teach effectively because of the lack of adequate teaching and learning support materials that are relevant to the local situation. Learning materials should be linked to the local environment and learners' experience. The school environment can be used as a learning resource and teaching and learning support materials can draw on natural resources as the local context for learning. Teachers need to be involved in materials development from the very start, to build on existing good practices.

Agricultural and environmental experiences can be used as a way of making basic education in rural areas more relevant to the local situation
School curricula are often dominated by competitive academic subjects, a situation which prioritises end-of-course examinations and discourages the development of locally relevant skills. Many of the subjects could be taught in a contextualised way, providing students with a more effective way to understand concepts.

New approaches to contextualisation of content and pedagogy using agricultural and environmental experiences offer encouraging options to improve the relevance of education. School gardens and the local environment can be used as media for contextualising teaching and learning, and have the potential to enable children to cope more effectively with general subject matter in school. At the same time, contextualised teaching and learning can contribute to the skills formation process.

Community ownership is crucial for relevant and effective basic education
Successful interventions to make basic education more relevant empower local communities to use their expertise. Good practices can be shared between the school and the community. Schools can function as experimental grounds and sustainable development centres where both modern and local knowledge is exchanged through interaction and involvement of different actors. Local experts have a wealth of relevant knowledge and skills, can be invited as resource persons to schools and can help teachers and learners learn about agriculture and the local environment. On the other hand, parents and community members can learn new ideas, methods and techniques from their children and teachers, from school gardens and school demonstration plots. Extension officers can assist with technical knowledge and link schools to other institutions and experts.

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5

Cultural Differences in Children's Environmental Worldview: A Three Country Study

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Abstract

The New Ecological Paradigm (NEP) is a popular measure of environmental concern and pro-environmental orientation of adults that has recently been modified for use with children. For this paper, we have collected questionnaires from 1586 children from three different countries and continents (i.e. Zimbabwe, Belgium and Vietnam). In this paper we will present the NEP-scores and the search for dimensionality of the scales across the different populations, by means of factor analyses. The results indicate that there is a clear and highly significant cultural influence on the environmental worldview of children, when developed and developing countries are compared.

Introduction

Over thirty years ago, Pirages and Ehrlich (1974), pointed out that the Dominant Social Paradigm (or DSP) had begun to be challenged by new beliefs and attitudes. The DSP underscores endless progress, growth and abundance of resources – beliefs that are accompanied by attitudes that contribute to the environmental degradation. In the new view, nature is seen as a limited resource, delicately balanced and subject to deleterious human inference: it challenges the DSP by rejecting the anthropocentric notion that nature exists only to serve human needs. In recent decades this new worldview has evolved from basic concerns on specific environmental problems to the recognition that humans are fundamentally altering the functioning of ecosystems and their constitution (i.e. biodiversity), resulting in unpredictable and irreversible changes. In 1978, Dunlap and Van Liere named this new social paradigm or worldview the New Environmental Paradigm (or NEP). At the same time, they constructed a scale to measure the proposed shift in people's worldviews at the level of human-environment interaction. After discussion on the multidimensionality of the scale and the nature of the terminology, it was revised by Dunlap et al. (2000), to become the New Ecological Paradigm (also NEP). Both versions of the scale have been popular measures of environmental concern and pro-environmental orientation of adults. Many researchers have used the scale in a wide range of contexts to assess adults' perceptions concerning the environment (e.g. Vining & Ebreo, 1992; Bechtel et al., 1999; Corral-Verdugo & Armendáriz, 2000; Schultz et al., 2000a, b; Johnson et *al.,* 2004; Rideout et al., 2005). While Dunlap & Van Liere (1978) found that the NEP scale measured a single dimension, other authors have found that it measures

up to four dimensions (e.g. Bechtel et al*.*, 1999; Edgell & Nowel, 1989; Roberts & Bacon, 1997; Van Petegem & Blieck, 2006).

Children's environmental beliefs and attitudes have been studied extensively (e.g. Wals, 1992; Bogner & Wilhelm, 1996; Barazza, 1999; Connell et al., 1999; Fien et al., 2002; Loughland, Reid & Petocz, 2002; Tuncer, Ertepinar, Tekkaya & Sungur, 2005; overview in Rickinson, 2001) but with little methodological uniformity, resulting in evidence that is less robust than that for adults. In 2005, Manoli et al. modified the NEP scale for use with children (aged 10-12, ISCED1&2 levels), thus creating an instrument that can be applied in a wide variety of contexts, making results from different studies comparable. Such uniform information on children's worldviews and pro-environmental beliefs can be of great interest for policymakers, developers of environmental learning programs, and researchers interested in the development of environmental attitudes in young people.

An intriguing field of research in which the Manoli *et al.* (2005) scale can be used is the cross-cultural comparison of children's environmental worldviews. For adults, differences in the worldview, assessed with the NEP scale, have been shown by different researchers (e.g. Bechtel et al., 1999; Corral-Verdugo & Armendàriz, 2000). Van Petegem & Blieck (2006) were the first to find significant differences between the worldview of children from different cultures, using the NEP scale for children.

In this article we investigate the worldview of Belgian, Vietnamese and Zimbabwean children, using Manoli et al.'s (2005) NEP scale for children. We examined if these children held beliefs consistent with (a) the DSP, which upholds human dominance over nature, and faith that progress and technology will eventually be capable of solving all problems including an ecological crisis, or (b) the NEP, based on humans as part of nature and on limitations to growth. We also examined the cross-cultural multidimensionality of the NEP scale for children, and compared the children's responses in relation to the different dimensions. In this context, it is also important to point out the position of the three studied countries on the United Nations Development Programme's 'Human Development Index' (or HDI) which is a comparative measure of life expectancy, literacy, education and standard of living and child welfare for countries worldwide: Belgium is at position 14, Vietnam

at 101 and Zimbabwe at 150. The Vietnamese sample is taken from children in schools in the area of the capital city, whereas the majority of the Zimbabwean children in our sample are part of a rural community. This allows us to compare the NEP scores of children from an industrialised country (the Belgian sample), an urban community in a developing country (the Vietnamese sample) and a rural community in a developing country (the Zimbabwean sample).

Methods

The 15-item NEP scale, revised by Manoli et al. (2005) for use with children, consists of eight items assessing an ecological – man as part of nature – view and seven items assessing an anthropocentric – man as ruler over nature – view. For example "When humans disturb nature it often produces terrible results" is an ecological item and "Humans will someday learn enough about how nature works to be able to control it" is an anthropocentric item.

The scale has a five-point Likert-type scale: strongly agree (5), agree (4), agree nor disagree (3), disagree (2), strongly disagree (1) and I don't know (0). The value of the 'I don't know' was regarded as a missing value and is not included in the analyses. The mean NEP score is calculated as the responses contributing to pro-ecological conceptions for each item: for ecological items this is the sum of the categories 'strongly agree' and 'agree', for anthropocentric items 'disagree' and 'strongly disagree'. Due to this nature of the instrument, scoring high on any item contributes to a higher NEP score. In general, a NEP score above 45 indicates pro-ecological conceptions.

The scale was administered class-wise in English to 524 pupils in Zimbabwe between 13 and 15 years old (280 girls and 242 boys – 2 unknown) and to 449 pupils in Vietnam between 13 and 14 years old (230 girls and 212 boys – 7 unknown). In Belgium, 613 children of 13 years old (347 girls and 246 boys – 20 unknown) filled out a Dutch version of the questionnaire. In total, nine schools of general and technical education were asked to take part in the research. The schools were chosen for reasons of attainableness and willingness to cooperate. The pupils were not in a specific environmental class or program. All classes correspond to ISCED2 level. The scale was originally designed for children aged 10 to 12; we used it for older children (between 13 and 15). In previous research we tested the comprehensibility of the scale for 13 to 15 year old children (Van Petegem & Blieck, 2006). No remarkable problems were reported.

Results

First we present the response frequency distribution of the responding Belgian, Zimbabwean and Vietnamese children, including the percentage agreement with the NEP perspective, i.e. the NEP scores. Secondly we will present the results of our search for dimensionality of the NEP scale, by means of factor analysis. Finally, the mean responses over the different dimensions found are compared.

The fact that the scale doesn't measure one single dimension, as Dunlap and Van Liere (1978) assumed, shows that there is an underlying consistency between different items from the instrument, explaining the same aspect of the total variance. This means that there is more to the scale than just the NEP score at itself. But to make (future) comparison possible with other research we do still present and discuss the NEP scores.

Children's worldviews
Table 1 shows the response frequency distribution in terms of percentage of children choosing each response and the total NEP score for all three data sets. It is clear that the Belgian children are more in favour of the NEP worldview (mean NEP score 63.2) than the children in Vietnam (mean NEP score 58.9) and in Zimbabwe (mean NEP score 51.4), indicating that Belgian children display pro-ecological conceptions more than children from Vietnam, and that children from both countries display more pro-ecological conceptions than children in Zimbabwe (all $p < 0.001$)

Belgian responding children score high on both types of items (mean ecological 73.3 – mean anthropocentric 56.8). Vietnamese children in our sample have a comparable ecological score (73.5) but score lower on the anthropocentric items (39.4). The Zimbabwean group scores lowest both on ecological (65.7) and anthropocentric (32.5) items.

Dimensionality of the scale
We used a principal-components factor analysis (PCA) with varimax rotation, showing three dimensions. This three factor model explained a total of 37.3% of the variance in results obtained (see table 2). We call the three dimensions arising from the analysis: 'Limits to growth' (LIM), 'Balance of nature' (BAL) and 'Man above nature' (MAN). Four items (NEP 1, 9, 10 and 11) load heavily on the LIM component. Five items (NEP 3, 5, 7, 13 and 15) load on the BAL component and five items (NEP 2, 4, 8, 12 and 14) loaded on the MAN component (see table 2). Item six 'The earth has plenty of natural resources if we just learn how to use them' (6) was disregarded from the NEP scores, as it didn't load sufficiently on any of the components in the factor analysis in our research. This result is in line with the findings of previous research (Dunlap et al., 2000; Rideout et al., 2005). We agree with Rideout et al. (2005) that NEP item 6 is probably misinterpreted by respondents. The total NEP score was then defined as the sum of the scores of the other 14 items.

Table 1. Frequency distributions for the NEP scale for all groups
(N_{BEL} = 613, N_{ZIM} = 524, N_{VN} = 449, in percentages, frequency between brackets)
SA = strongly agree, A = agree, AnD = agree nor disagree, D = disagree, SD = strongly disagree, ? = I don't know
BEL = Belgium, ZIM = Zimbabwe, VN = Vietnam

	Item	Country	SA	A	AnD	D	SD	?	NEP-score*
1.	We are getting close to having too many people on earth	BEL	15.7 (74)	26.7 (126)	32.8 (155)	14.0 (66)	10.8 (51)	21.7 (133)	42.4
		ZIM	42.0 (206)	25.5 (125)	13.9 (68)	9.6 (47)	9.0 (44)	6.1 (32)	67.5
		VN	54.1 (243)	29.8 (134)	5.1 (23)	2.4 (11)	2.0 (9)	6.5 (29)	84.0
2.	Humans have the right to change the natural environment to fit their needs.	BEL	6.8 (38)	14.6 (82)	27.0 (151)	30.2 (169)	21.4 (120)	7.3 (45)	51.6
		ZIM	26.5 (132)	21.0 (105)	11.0 (55)	21.0 (105)	20.4 (102)	4.6 (24)	41.5
		VN	12.2 (55)	16.9 (76)	12.7 (57)	24.5 (110)	30.1 (135)	3.6 (16)	54.6
3.	When humans disturb nature it often produces terrible results.	BEL	38.3 (220)	37.6 (216)	19.8 (114)	3.3 (19)	1.0 (6)	5.7 (35)	75.9
		ZIM	34.2 (161)	29.3 (138)	16.3 (77)	10.8 (51)	9.3 (44)	9.4 (49)	63.5
		VN	57.5 (258)	27.2 (122)	6.9 (31)	1.8 (8)	3.3 (15)	3.3 (15)	84.6
4.	Human cleverness and skill will make sure that we do NOT ruin the earth.	BEL	8.9 (45)	16.1 (81)	32.2 (162)	24.7 (124)	18.1 (91)	16.6 (102)	42.8
		ZIM	24.1 (111)	22.2 (102)	18.7 (86)	20.4 (94)	14.6 (67)	11.5 (60)	35.0
		VN	24.9 (112)	23.4 (105)	18.9 (85)	18.0 (81)	6.7 (30)	8.0 (36)	24.7
5.	Humans are greatly mistreating the environment.	BEL	29.6 (173)	31.7 (185)	29.8 (174)	6.5 (38)	2.4 (14)	3.3 (20)	61.3
		ZIM	33.4 (160)	29.2 (140)	12.9 (62)	14.2 (68)	10.2 (49)	7.3 (38)	62.6
		VN	32.5 (146)	36.3 (163)	12.0 (54)	8.5 (38)	7.6 (34)	3.1 (14)	68.8
7.	Plants and animals have as much right as humans to live.	BEL	62.4 (362)	21.6 (125)	11.4 (66)	3.3 (19)	1.4 (8)	2.9 (18)	84.0
		ZIM	50.5 (257)	26.1 (133)	8.1 (41)	8.6 (44)	6.7 (34)	2.3 (12)	76.6
		VN	55.9 (251)	31.8 (143)	4.0 (18)	1.8 (8)	2.2 (10)	4.2 (19)	87.8
8.	Nature is strong enough to handle the bad effects of modern developed countries.	BEL	2.4 (13)	5.8 (31)	14.7 (79)	36.6 (197)	40.5 (218)	11.4 (70)	77.1
		ZIM	13.7 (59)	28.0 (121)	22.0 (95)	19.9 (86)	16.4 (71)	16.6 (87)	36.3
		VN	8.7 (39)	9.8 (44)	13.6 (61)	19.4 (87)	36.5 (164)	12.0 (54)	55.9
9.	Even with our special abilities humans must still obey the laws of nature.	BEL	34.1 (183)	45.8 (246)	16.6 (89)	3.0 (16)	0.6 (3)	11.4 (70)	79.9
		ZIM	58.2 (292)	26.5 (133)	7.0 (35)	3.2 (16)	5.2 (26)	3.6 (19)	84.7
		VN	14.0 (63)	24.1 (108)	25.8 (116)	18.0 (81)	4.9 (22)	13.1 (59)	38.1
10.	The so-called "environmental crisis" facing humans has been blown out of proportion (exaggerated).	BEL	3.8 (17)	9.1 (41)	30.2 (136)	34.6 (156)	22.4 (101)	25.0 (153)	57.0
		ZIM	11.3 (41)	21.3 (77)	27.9 (101)	22.4 (81)	17.1 (62)	30.5 (160)	39.5
		VN	37.4 (168)	33.0 (148)	14.0 (63)	4.7 (21)	2.4 (11)	8.5 (38)	7.1
11.	The earth is like a spaceship with very limited room and resources.	BEL	12.9 (52)	32.5 (131)	33.7 (136)	10.9 (44)	9.9 (40)	32.6 (200)	45.4
		ZIM	21.6 (101)	25.9 (121)	16.9 (79)	16.0 (75)	19.7 (92)	9.9 (52)	47.5
		VN	57.7 (259)	24.7 (111)	5.1 (23)	4.7 (21)	2.4 (11)	5.3 (24)	82.4
12.	Humans were meant to rule over the rest of nature.	BEL	2.3 (13)	3.4 (19)	12.4 (69)	29.0 (162)	52.9 (295)	7.0 (43)	81.9
		ZIM	33.8 (161)	20.0 (95)	17.0 (81)	16.6 (79)	12.6 (60)	7.1 (37)	29.2
		VN	4.5 (20)	6.5 (29)	7.8 (35)	23.4 (105)	51.0 (229)	6.9 (31)	74.4
13.	Nature is very delicate and easily harmed.	BEL	39.2 (224)	37.8 (216)	15.9 (91)	5.4 (31)	1.6 (9)	5.5 (34)	77.0
		ZIM	25.4 (117)	28.0 (129)	17.4 (80)	16.3 (75)	13.0 (60)	10.5 (55)	53.4
		VN	20.0 (90)	38.3 (172)	11.6 (52)	9.1 (41)	5.1 (23)	15.8 (71)	58.4
14.	Humans will someday learn enough about how nature works to be able to control it.	BEL	12.4 (55)	24.2 (107)	33.0 (146)	19.2 (85)	11.3 (50)	26.6 (163)	30.5
		ZIM	37.8 (188)	36.2 (180)	12.7 (63)	6.0 (30)	7.2 (36)	4.6 (24)	13.3
		VN	10.7 (48)	23.8 (107)	16.5 (74)	13.8 (62)	5.8 (26)	29.4 (132)	19.6
15.	If things continue as they are going, we will soon experience a major environmental disaster.	BEL	45.6 (227)	32.1 (160)	18.7 (93)	3.2 (16)	0.4 (2)	17.9 (110)	77.7
		ZIM	46.6 (219)	23.0 (108)	10.4 (49)	8.7 (41)	11.3 (53)	10.1 (53)	69.6
		VN	63.0 (283)	21.4 (96)	4.7 (21)	2.4 (11)	3.1 (14)	5.3 (24)	84.4

The NEP-score was calculated as the summary positive response frequency for each item:

    'SA' + 'A' for the ecological items (1, 3, 5, 7, 9, 11, 13, 15)

    'D' + 'SD' for the anthopocentric items (2, 4, 8, 10 ,12, 14)

Mean Total Pro-NEP %

Belgium	**63.2**
Zimbabwe	**51.4**
Vietnam	**58.9**

Table 2. Factor loadings of the NEP items

		Scale items	Factors		
			1	2	3
Limits to Growth	1	There are too many (or almost too many) people on earth.	.523		
	9	People must still obey the laws of nature.	.538		
	10	The so-called "environmental crisis" facing humans has been blown out of proportion.	.626		
	11	The earth is like a spaceship with very limited room and resources.	.650		
Balance of Nature	3	When people mess with nature it has bad results...		.507	
	5	People are treating nature badly.		.515	
	7	Plants and animals have as much right as people to live.		.498	
	13	Nature is very delicate and easily harmed.		.478	
	15	If things don't change, we will have a big disaster in the environment soon.		.627	
Man over Nature	2	People have the right to change the natural environment to fit their needs.			.528
	4	People are clever enough to keep from ruining the earth.			.546
	8	Nature is strong enough to handle the bad effects of modern developed countries.			.675
	12	People were meant to rule over the rest of nature.			.666
	14	People will someday know enough about how nature works to be able to control it.			.567
Eigenvalue			1.481	1.987	2.190
Percentage of variance		37.30*	9.45	13.25	14.60

* Total percentage of variance explained by the three factor model
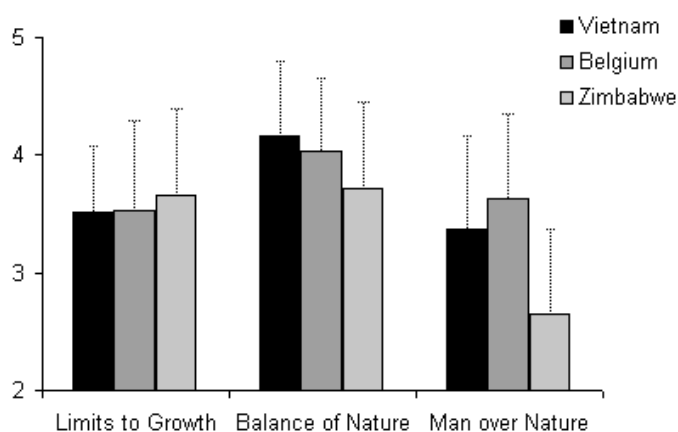
Figure 1. Comparison of groups per dimension. A high score indicates pro-ecological conceptions.

To make comparison possible between the answers of the children, with regard to the dimensions, the directionality of the anthropocentric items was changed, and the score per group per dimension was calculated as the mean of all individual ecological and reversed anthropocentric items (see figure 1). Our analysis shows that there are significant differences between all countries for all dimensions: $F(BAL)=61.6$, $p<0.001$; $F(LIM)= 6.5$, $p=0.002$; $F(MAN)=256.7$, $p<0.001$. Post-hoc tests (see table 3) show that all groups differ significantly from each other for all dimensions (all $p<0.015$), except Belgium and Vietnam for the LIM dimension (both $p=1.00$).

Table 3. Mean comparison between the answers of the Belgian, Vietnamese and Zimbabwean children for the three dimensions. Mean differences marked in bold are statistically significant.

Dimension	Mean ± Std. Error	Compared to	Mean Difference ± Std. Error	Sig.
	ZIM	BEL	**.13** ± .042	.006
	3.66 ± 0.73	VN	**.14** ± .045	.005
Limits to growth	**BEL**	ZIM	**-.13** ± .042	.006
	3.53 ± 0.77	VN	.01 ± .044	1.000
	VN	ZIM	**-.14** ± .045	.005
	3.57 ± 0.71	BEL	-.02 ± .044	1.000
	ZIM	BEL	**-.98** ± .044	.000
	2.65 ± 0.73	VN	**-.71** ± .048	.000
Man over Nature	**BEL**	ZIM	**.98** ± .044	.000
	3.63 ± 0.72	VN	**.27** ± .046	.000
	VN	ZIM	**.71** ± .048	.000
	3.37 ± 0.79	BEL	**-.26** ± .046	.000
	ZIM	BEL	**-.33** ± .040	.000
	3.71 ± 0.74	VN	**-.45** ± .043	.000
Balance of Nature	**BEL**	ZIM	**.33** ± .040	.000
	4.04 ± 0.62	VN	**-.12** ± .041	.014
	VN	ZIM	**.45** ± .043	.000
	4.16 ± 0.64	BEL	**.12** ± .041	.014

Discussion

The objective of this study was to examine and compare the environmental worldview of children in Belgium, Vietnam and Zimbabwe. The results of this study reveal clear differences between ecological conceptions of the responding children from these countries. Belgian children in our study score highest of all three groups on Manoli et al.'s revised NEP scale for children (2005). The Zimbabwean children score lowest but still their NEP score indicates pro-ecological conceptions. The children in the Vietnamese subgroup have a score between the Belgian and Zimbabwean. Belgian responding children score high on both types of items (ecological and anthropocentric). Vietnamese children in our sample have a comparable ecological score but score lower on the anthropocentric items. The Zimbabwean group scores lowest both on ecological and anthropocentric items. Given that Belgium is a highly urbanised and developed country (HDI 14), and that Vietnam (HDI 101) and Zimbabwe (HDI 150) are both developing countries, these results suggest that children from western countries are more concerned about environmental problems than children from developing countries. In this view, the degree of development is positively correlated to pro-ecological conceptions. We might think of the basis of such a model in terms of Maslow's (1943) 'hierarchy of needs', according to which as one kind of need is satisfied another kind arises. For people in development countries the natural environment is essential for the satisfaction of survival needs. For people in western, industrialised countries it becomes a means to feelings of self-expression and accomplishment. To those whose needs lie between these two extremes the perceived significance of the natural environment might be low. Scott et al. (2003) make a similar suggestion on the differences in the relation to the environment between the rich, the poor, and those in between.

Knowing that the Vietnamese sample was taken from children in the area of the capital city and that the Zimbabwean respondents are part of a rural community, we could go further and suggest that in developing countries, children from urban communities have conceptions that are more environmentally orientated than those of children from rural communities. This has already been shown by Bogner & Wiseman (1997) for children in a western country (Germany). This hypothesis, which seems to be supported by the results of our analysis of the children's answers to the questions in the NEP scale, is however too simplified and could create a negative image of the environmental worldview of children in developing countries. This observation, and the fact that more developed nations leave the deepest ecological footprints and are the driving forces behind the resource extraction and manufacturing around the world (Mckeown et al., 2002), urged us to submit our comparative data to a dimensionality analysis, looking at differences at a deeper level of the scale.

Three different dimensions arose from the factor analyses we performed. Our model (with all factor loadings above 0.4 and explaining 37.30% of the

observed variance) for the dimensionality of the NEP scale supports models described in previous research (Albrecht et al., 1982; Noe & Snow, 1990; Shetzer et al., 1991; Gambro, 1995; Bechtel et al., 1999; Van Petegem & Blieck, 2006). When these dimensions are included in the interpretation of the answers of the responding children, it becomes clear that there is more at hand. The answers of all three countries indicate a shared ecological perspective in which they are aware of the negative impact humankind has on nature. The Zimbabwean and Vietnamese respondents, however, also feel dominant over nature and believe they have the right to use nature for their needs. This conception is strongest in Zimbabwean children. They have faith in the problem-solving abilities of science and technology and in the strength of nature to recover from human interference. Vietnamese children display comparable environmental conceptions to Zimbabwean children, but they do believe that the earth has limited resources. The Belgian children in our research do not share the human-dominance view. Our results suggest that responding children in the (studied) countries in development have both an ecological and a utilitarian view of the environment. This dualism was also found (for adults) in Mexican and Brazilian communities (Bechtel et al., 1999; Corral-Verdugo & Armendáriz, 2000), and is strongest in the Zimbabwean sample. Corral-Verdugo & Armendáriz (2000) suggest that in industrialised societies, acceptance of the NEP implies a clear rejection of the anthropocentric views of the DSP. However, in less industrialised societies, the distinction between the two worldviews may not be as clear cut, implicating a holistic view on the human-environment relationship. The results of our research clearly support their hypothesis.

Caldwell (1990) and Chokor (1993) suggest that indigenous, non-industrialised societies tend to believe in the profound connection between humanity and nature. They find compatibility between the natural balance and the needs of humans in using natural resources. This is clearest in our Zimbabwean sample, where children are concerned with the negative human impact on the ecological systems and at the same time believe

in humankind's usage of nature. The majority of the population in Zimbabwe (65%) lives in rural areas where they rely directly on natural resources for their livelihoods (Chenje et al., 1998). This strong reliance on natural resources might explain the combined ecological and utilitarian view of the environment in the Zimbabwean sample. In fact, belief in the need to balance between protecting the environment and satisfying human needs fits well with many definitions of sustainable development (e.g. Goodland, 1995; Corral-Verdugo & Armendáriz, 2000).

Conclusion

In conclusion, our results indicate that there is a clear and highly significant cultural influence on the environmental worldview of children. This difference in NEP acceptance at the level of human-nature interaction could be explained by distinct experiences of the natural world acquired in early childhood as these significantly influence environmental concern (Korhonen & Lappaleinen, 2004). Our results suggest that the degree of development (for example measured by the HDI) of a community is positively correlated to pro-ecological conception, but also that the rejection of the DSP by the NEP is a phenomenon that could well only be present in western societies, whereas in less industrialised societies the NEP and DSP could coexist in a holistic paradigm. Therefore, the model proposed above should be nuanced. Furthermore, the results of this study stress the importance of analysing the dimensionality of the NEP scale when it is used to research and compare environmental worldviews. As our research clearly indicates, cross-cultural differences in the environmental worldview of children are too subtle to be measured by a one-dimensional NEP scale. In doing so, one might create an over-simplified and even incorrect image of the ecological conceptions of the studied group(s).

The present study is only a small part of ongoing studies in environmental conceptions of children. In further research it would be interesting to explore other cultures and contexts, including the effects of personality on the environmental worldview, as well as social and ethnic background, and educational activities.

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The Creolization of Environmental Education: Exploring Hybrid Spaces in Seychelles

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Abstract

Western epistemology and research methodologies have held centre stage in environmental education research since its inception. Non-western cultures have also cultivated their own approaches to environmental education research, but remain under-represented in the literature. How do we reconcile diverse approaches to research, and encourage greater exchange between environmental educators and scholars in diverse cultural contexts? In this paper, I focus on Seychelles to explore the concept of hybridity, looking for spaces where western and non-western ways of knowing collide, creating new creolized forms of environmental education research and practice that disrupt Eurocentrism and offer new postcolonial possibilities for environmental education.

The Creole culture of the Seychelles islands is the result of a long history of cultural mixing dating back to the initial settlement of these uninhabited islands by Europeans and their African slaves in the eighteenth century. Today, most Seychellois proudly consider themselves Kreol and attribute their ancestry to a mix of African, Indian, Chinese, European, and other origins. However, Creole culture is never stagnant, but continually negotiated between the past, present and future. In a post-colonial Seychelles, everyone may be Kreol, but what it means to be Kreol is constantly being re-invented under the influences of nationalism, economic globalisation, the media, immigration and emigration, tourism, consumerism, and an increasing awareness of local and global environmental problems.

Because of this long and unfinished history of creolisation, Seychellois culture escapes classification as either 'western', 'non-western' or 'indigenous'. The same is true for this small island state's approaches to environmental conservation and environmental education, which oscillate freely, comfortably, and arguably effectively between traditional Kreol folk practices and ways of knowing (which themselves have both multiple roots and an evolving nature) and 'western' ways of knowing. This ambivalence encapsulates what Homi Bhabha (1994) describes as an 'interstitial' or 'hybrid' space between cultures, and can perhaps offer some insights as a potential site of resistance to imposed or hegemonic notions of what environmental education research and practice should be.

Eurocentrism in Environmental Education

Today, many critics of formal education argue that it serves only to maintain the global economic and political *status quo*, and almost completely ignores pressing issues of social and ecological justice (Davies, 1996; Gruenewald, 2004; Kincheloe, 2004; Orr, 1994; O'Sullivan, 1999). A growing body of literature written from a postcolonial perspective similarly challenges this imperialist agenda of formal education but also calls particular attention to the fact that education systems worldwide, whether they be in former colonies or in the countries of former colonisers, continue to bear the stamp of European colonial history in terms of the hegemony of western modes of knowledge (Crossley & Tikly, 2002; Goldberg & Quayson, 2002; Hickling-Hudson, 2006) and the dominance of Eurocentric research in education (Samoff, 2003). Postcolonial theory, as applied in education, seeks to disrupt its Eurocentric and neocolonial remnants and more, work towards new models of education that embrace multiculturalism, engage diverse ways of knowing, and ensure that curriculum and pedagogy are relevant and appropriate to specific cultural and community settings.

These critiques share much in common with forms of environmental education that challenge the systems that perpetuate social and ecological injustices, and emphasise collaboration and transformative action to heal and celebrate the relationships between humans and the wider community of life on earth. Transformative forms of environmental education, such as that influenced by eco-feminism, explicitly makes space for diverse ways of knowing in practice and research – spiritual, experiential, emotional, intellectual, creative – and opens the way for what O'Sullivan (1999) calls, "a radical restructuring of all current educational directions" (p. 2).

However, a scan of the international academic environmental education literature indicates that this field has Eurocentric tendencies – much of the research originates from what Tikly (2004) calls "the imperial centre", i.e. North America, the UK and Europe, and Australia, and focuses on the theory and practice of environmental education in these particular (albeit diverse) cultural contexts. Methodologies used in environmental education research are frequently grounded in western rationalist or critical ways of knowing, although there has been a significant shift in recent years toward more qualitative and participatory research methodologies such as action research and narrative inquiry (Hart & Nolan, 1999) that make space for alternative epistemologies.

While this work is interesting and often inspiring, it would be interesting and fruitful to hear what the rest of the world is doing to try to shift the purpose of education toward socio-ecological sustainability. A quick internet search reveals that most countries around the world *are* engaged in environmental education practices. Why aren't they all contributing to the scholarly research and

literature? There may be a number of reasons, and the case of Seychelles can help to illustrate them.

One barrier is the dominance of the English language (Mokuku, 2002; Schugurensky, 2003). Mokoku (2002) notes that most people need to converse in their mother tongue when critically engaging with ideas and practices, and indeed this is the case in Seychelles where such critical conversations about environmental education would normally take place in Kreol. Mokoku (2002) cites Ngugi wa Thiong'o who observed that "knowledge within these environments 'is caged' within the linguistic fence of its colonial inheritance'" (p. 138). Some of the difficult and abstract language encountered in academic environmental education literature compounds the problem.

Seychelles, like many other majority countries, has limited capacity and funding to undertake environmental education research as conceived by the western academy. Lacking a university, many would-be researchers have extremely limited access to subscription journals in any discipline let alone environmental education, making it difficult for potential scholars (who are well-versed in English) to keep up with international debates.

Another more formidable barrier may be the dominance of western rationalist epistemology in international environmental education research, literature and conferences which can intimidate, repel or seem irrelevant to researchers and practitioners from majority countries (Agyeman, 2002). In Seychelles, environmental education practitioners *are* engaged in knowledge production, but like many non-western cultures, their work and networking operates outside of the western research community (Chaudhary, 1997; Smith, 1999).

Clearly the field of international environmental education can only benefit from a greater exchange of theory, practice and research methodology from across cultures. But how to facilitate this? The idea of creolisation offered from the postcolonial cultural theory literature may offer some insights. The next section will provide a brief overview of the origins and meaning of this term before it is applied to the specific context of environmental education in the Seychelles Islands.

Hybridity and Creolisation
Hybridity is now a widely used and hotly debated metaphor in cultural and postcolonial literature. The term was initially used in biology and agriculture to describe the mixing of species, and later was applied (problematically) to racialised discourses of evolutionism in the nineteenth century. More recently, the term hybridity has been appropriated by postcolonial and cultural theory as a metaphor to describe the mixing of cultural forms, practices and discourses (Hutnyk, 2005, Kraidy, 2002; Pieterse, 2001; Stoddard & Cornwell, 1999).

Critics of the term hybridity call into question its dubious racialised past, its seeming essentialist assumption of the purity of all elements prior to mixture, and its often ahistorical or shallow treatment of the violence and injustice behind many instances of cultural mixing (Hutnyk, 2005; Szwed, 2003; Pieterse, 2001; Kraidy, 2002). Other critics have also pointed out how the term 'hybridity' is now being appropriated by proponents of cultural globalisation as an uncritical celebration of what is essentially the hegemony of westernisation or Americanisation (Hutnyk, 2005; Kraidy, 2002).

Creolisation is another term, generally attributed to the field of linguistics, that is often employed to describe this same process of mixture (Eriksen, 1999; Stoddard & Cornwell, 1999; Szwed, 2003). Szwed (2003) describes it as, "an ongoing dialogue that remains remarkably open and inviting of participation" and thus "retains a certain residual ambiguity and variability" (p. 10), that has led to its current use with reference to foods, clothing, languages, architecture, literature, even individuals and entire races.

Stoddard and Cornwell (1999) point out that hybridity and creolisation are not interchangeable concepts. They explain that the term creolisation is much more grounded in specific histories and places of plantation slavery (thus paying attention to issues of hegemony) and at the same time more attentive to new connections rather than hybridity's focus on multiple roots (p. 349). Creolisation thus simultaneously looks to the past and to the future, "engaging with ancestral relationships and allowing new forms and relationships to emerge" (Braithwaite, cited in Szwed, 2003, p. 12).

Seychelles' Creole culture reflects a history of European colonisation, slavery, and later, immigration, emigration and globalisation. It is richly intertwined with the ecology and natural history of the mountainous tropical islands. It is reflected in local environmental education practices. For this reason and the others stated above, the concept of creolisation will be employed in this paper to explore the mixing of cultural forms, practices and discourses specific to environmental education practice and research in Seychelles.

Creolisation of Environmental Education in Seychelles
In Seychelles, the valorization of Kreol language and culture has been a highly conscious political process (Seychelles Ministry of Education and Information, 1985; Szwed, 2003), used to connect all members of society, despite socio-economic, religious or racial differences. This celebration of creolisation sets Seychelles apart from countries such as Mauritius, Haiti, and Trinidad which continue to struggle with its negative connotations (Boswell, 2005; Eriksen, 1999; Marlow-Ferguson, 2002; Stoddard & Cornwell, 1999). Today, Kreol is an official language alongside French and English. It was developed into a written form (hence Kreol rather than creole) in the 1980s to facilitate communication in the mother tongue of the majority of Seychellois (Haring, 2003). Early schooling is in Kreol, there are books, novels, newspapers, radio and television

programs in Kreol. People converse, text message, joke, flirt, gossip, conduct research, sing and perform in Kreol. Many Seychellois of all ages appreciate Kreol food, music, dance, poetry, stories and media programs insomuch as they also enjoy those from other cultures.

Environmental education in Seychelles has evolved within this cultural context, and can be traced back to the early 1980s when the postcolonial socialist government introduced a formal education policy closely tied to national development. This document specifically describes appropriate development as that which is "good for man [*sic*] and good for his environment and fully comprehends the necessity of inter-relating human and environmental needs within a complete ecosystem" (Seychelles Ministry of Education and Information, 1985, p.10). Education was identified as one of the principal means of achieving this kind of development.

In the 1980s, environmental education was integrated across the primary curriculum and included as a component of secondary science education. In 1990, Seychelles launched its first national Environmental Management Plan (EMPS 1990-2000), which prompted further integration of environmental education across the curriculum at all levels, the development of local teaching/learning resources, and the implementation of teacher education programs. Today, this process continues and is overseen by a national environmental education coordinating committee that brings together government, NGO and other stakeholders involved in environmental education in formal education. All 34 primary and secondary state schools have an environmental education resource person, at least one environment or wildlife club, and they participate actively in national environmental events such as the Eco-School competition and SUBIOS, the annual marine conservation and arts festival. An environmental education unit within the Ministry of Education coordinates these initiatives while the National Institute for Education provides two compulsory courses in environmental education for all primary and secondary student teachers. Regular workshops and meetings provide opportunities for teachers to gather together to share their experiences and plan new strategies and initiatives for promoting environmental education in schools.

While these achievements are remarkable, environmental education in Seychelles' schools suffers from the same constraints seen in many other countries: disciplinary boundaries, timetabling, resources, time, and conflicts with other curriculum and assessment priorities (Grace & Sharp, 2000; Orr, 2004). Also, a didactic and teacher-centred approach tends to be the norm among Seychellois teachers (Purvis, 2004), and this clearly conflicts with the more student-centred, critical, collaborative and action-oriented approaches promoted by advocates of socially critical and transformative education *for* the environment (Gough, 1997).

While there is clearly room for improvement, the point is that in Seychelles, environmental education is *not* a

marginalised component of formal education, unlike many industrialised countries where it *is* (Gough, 1997; Gruenewald, 2004; Hart, 2003, Orr, 1994). Environmental education in Seychelles is nationally recognised as a cross-cutting theme that links formal and informal education and complements national strategies for ecological sustainability (Government of Seychelles, 2000).

Why does Seychelles place such apparent emphasis on environmental education? To answer this question it is important to remember that environmental education practices in Seychelles are nestled within the Kreol cultural political context of a small island developing state trying to find a balance between a history of and reputation for environmental conservation, and the pressures of economic development which in many ways of course work against the grain of socially critical and transformative environmental education. However, it is these pressures which are today's creolising influences, a mix of tradition and modernisation. It is in the hybrid spaces between these influences that knowledge production in environmental education unfolds. In the following section, three different interrelated hybrid spaces are explored, each revealing possibilities for the creolisation of environmental education research and practice.

Hybrid Space #1 – Between tradition and modernity

The current generation of middle-aged working adults in Seychelles is caught between eras of tradition and modernity. Most people in this category enjoy the benefits and conveniences of modern life, such as televisions, cars, electricity, and imported consumer goods, but are aware of the obvious environmental price tag. They can see the changes to Seychelles' environment that have occurred within their lifetime as a result of economic development, i.e. reduced availability of some local foods and crops, degradation of rivers, beaches and other habitats, growing solid waste and pollution problems. This malaise with the price of economic development might explain why Seychelles' national education policies, decision-makers, community leaders and teachers so readily embrace the idea of environmental education if not necessarily the practice. Environmental education's appeal lies in its offer of a space for finding a balance between ecological health, cultural tradition and socio-economic development. Illustrating Braithwaite's point (cited in Szwed, 2003, p.12), about creolisation being a process of merging past and future, in Seychelles environmental education itself is a space that allows new, more sustainable relationships between people and ecosystems to emerge, in light of how these were in the not so distant past.

Hybrid Space #2 – Between culture and environment

As there was no indigenous population prior to European colonisation, cultural practices such as language, stories, song, dance and cuisine have multiple roots in Africa, India, China, Europe and other places. As Haring (2003) explains, "where societies come into a colonized, multiracial existence

for the benefit of a European minority, the normal reaction of the constituent groups is to renegotiate culture" (p.19).

However, the culture of Seychelles has not been renegotiated within a vacuum but within the specific ecological context of these tropical islands. Kreol practices and beliefs may have roots in other lands but have been grafted and re-rooted in the verdant granitic mountains, rivers, marshes, lagoons and coral reefs. That interstitial space between what a western perspective considers opposites: culture and environment, is one where environmental education practices are continually being tested. Thus it is perhaps no wonder that environmental education commonly manifests itself in cultural forms such as colourful parades and rallies, traditional medicinal plant gardens, variety shows of traditional and modern song and dance and creative exhibitions. The creolized mix of influences and practices create space within environmental education for a diversity of ways of knowing: bodily, experiential, emotional, creative, spiritual and rational.

Many cultural / environmental education practices in Seychelles are more celebratory than overtly critical or confrontational. At best they are diplomatically suggestive of changes needed to counteract environmental degradation. However, these suggestions can be effective. For example, several years ago a student performance in front of Ministers and other influential people actually prompted the government to implement a ban on shark finning in Seychelles' waters (Larue, pers.comm. January, 2007). Advocating for more use of the arts and culture to bring about social and environmental change, Adams and Goldbard (2002) explain that "culture is an effective crucible for social transformation, one that can be less polarizing and create deeper connections than other social-change arenas" (p. 10). In their view:

> community cultural development activities are demonstrably the best available tools to teach the skills and values of true citizenship: critical thinking, interrogating one's own assumptions, exercising social imagination and creative problem solving, simultaneously holding in mind one's immediate interests and the larger interests of the community as a whole (Adams & Goldbard, 2002, p. 17).

In a small island state like Seychelles, the use of non-polarising cultural strategies to promote social and ecological sustainability through education makes a lot of sense. Inhabitants of small island states with tiny populations tend to have an ingrained awareness of ecological and social fragility that prompts them to minimise or mitigate overt conflict in the interests of stability and compromise (Bray & Packer, 1993). And so, cultural activities, being less confrontational, might indeed be a particularly effective strategy in the Seychellois context for bringing about change.

Inhabitants of small states also happen to have the advantage of proximity with influential community leaders (Bray & Packer, 1993), and so it is not uncommon for community leaders, ministers and even the president to attend national events where schoolchildren are able to voice their concerns and ideas about social and ecological problems to the audience through songs, skits, poetry and stories.

Hybrid Space #3 – Between Scientific Rationalism and Cultural Creativity

Environmental education in Seychelles, like that in many other countries, was initially strongly associated with science education despite recognition of its cross-disciplinary nature. However, over the last ten years there has been a noticeable shift here towards the exploration of environmental concerns in arts, personal and social education, and language classes. Also, teachers who coordinate environmental activities or clubs in their schools now come from a wide range of subject backgrounds.

While many environmental education practices in Seychelles can be classified as cultural or arts-based, they also very often incorporate a scientific approach, involving research in books and on the internet, visits by scientists who work as environmental conservation officers or technicians, field trips, observations and monitoring of species or habitats. These same projects then almost always also lead to creative cultural interpretations of the environmental problems under scrutiny and their solutions. Thus murals, exhibitions of scientific findings and artwork as well as the performance of plays, songs, dances and poetry are common occurrences in schools and national environmental events involving school children. The co-existence of these different forms of expression suggests a diversity of ways of knowing that have been embraced by the students and their teachers and that perhaps can be explained by the creolised nature of Seychellois society. Scientific rationalist ways of knowing seem to sit comfortably side by side with emotional, spiritual, creative and experiential expressions of understanding the human-environment relationship. This hybrid space between the often dichotomised poles of arts and science provides a rich context for exploring and expressing environmental concerns using a wide diversity of ways of knowing.

Final thoughts

Seychelles' creolised approach to EE has not been prompted by the findings of any formal research or studies. However, in the Seychelles (as everywhere in the world), school leaders, teachers, students, parents and others involved in environmental education are continuously reflecting, individually and collectively, on what methods work in this particular cultural context to engage students and create an impact in their communities. Is this not research? This process of reflexive action lacks the systematic approach that would qualify it as "research" by western scholarly standards, but resonates deeply with what Potts and Brown (2005) call anti-oppressive research. They insist that "the art of asking questions, building relationships, seeking answers

and coming up with more questions – is in the art of daily life" (p.257-8) and not something that is the sole privilege and domain of academics.

The hybrid spaces for environmental education practice and knowledge production that have been discussed here are perhaps particular to the context of Seychelles Kreol culture, but they may offer some insights for researchers and practitioners in other parts of the world:

- The story of Seychelles suggests the possibility that there are interesting and valuable developments in the practice of environmental education occurring outside of the environmental education literature.
- Cultures outside of the "imperial centre" may have important insights about how to integrate multiple ways of knowing into environmental education research and practices.
- If creolisation refers to the mixing of cultural forms and practices, then most communities around the world have undergone and/or are undergoing this process. Environmental educators everywhere need to recognise diversity and creolisation in their own communities, and to acknowledge the histories of social injustice embedded in much of this cultural mixing. By considering the hybrid spaces in their own cultural context, they might identify strategies for environmental education practices and research that are more relevant and responsive to local cultural realities and needs.

- Educators and students engaged in environmental education practices are also simultaneously engaged in knowledge production (research), even though their work may not necessarily conform to western scholarly standards for what counts as research.

Internationally, environmental education remains, after all these years, an extremely marginalised element of formal education. There is clearly an urgent need now for proponents of environmental education to explore new strategies for bringing about the changes needed in order for education to respond to the social and ecological crisis facing the planet. A starting point might just be to look for ways to tap into the rich repertoire of experience and knowledge held by environmental education practitioners from outside the imperial center.

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A trans-frontier conservation approach and the challenges for promoting education for sustainability in Botswana and the SADC region

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Abstract

Botswana and other SADC countries, which have vast areas of land set aside for wildlife conservation, provide opportunities for promoting environmental education in the region through the use of protected areas as resources for learning. The main emphasis of the protected areas environmental education programme lies in promoting education in, through and for the environment (Shaw, no date). This has effectively contributed to promoting first-hand experience of conservation in Botswana, and has now become a key approach in the teaching of EE in schools in the country, especially insofar as it leads to a change in behaviour and attitudes towards the environment.

Recently Southern Africa has seen the emergence of a new natural resources conservation approach called Trans-Frontier Conservation Areas (TFCAs), which emphasises joint management of natural resources by several countries. It is now a challenge for the affected countries in the TFCA areas to realign their protected areas EE programs in order to cater for the varying education needs of the countries, as envisioned in their respective national education policies.

This paper discusses the importance of protected areas in promoting education for sustainability in the SADC region, especially through the use of protected areas EE programs and Environmental Clubs in the region, in the light of emerging challenges in wildlife conservation such as the TFCAs.

Introduction

In an effort to ensure the continued existence of wildlife in the world, national parks, game reserves, sanctuaries, game farms, ranches and zoos were established. The SADC region is no exception in the process of establishing protected areas as a measure to promote wildlife conservation. This is further supported by the fact that the region is rich in biodiversity, which has benefited the region economically through tourism. In Botswana 17% or 100 000 square kilometers of the country's total land area is used for National Parks and Game Reserves (GOB, 1986). The country has also established Educational Game Reserves, Sanctuaries, Game Farms and Ranches, which all add to the areas set aside for wildlife conservation. The resources have also benefited communities and individuals economically through tourism and Community Based Natural Resources Management programmes (CBNRM). These programmes in Botswana are in line with both the regional and global advocacy of environmental sustainability. There is a need to ensure that as much as

the areas are used to promote the sustainability of wildlife, they are also used to promote education for sustainability. Current trends show that the SADC region, especially Botswana, has not done well in terms of using the protected areas to promote education for sustainability. The latest development in the field of wildlife conservation and management in the SADC region is the Trans-Frontier Conservation Areas (TFCA), which brings together several countries to jointly manage protected areas and share the economic and socio-cultural benefits of tourism. The process has, however, not taken on board the use of the areas to promote education for sustainability.

Several countries in the world, including those in the SADC region, have introduced environmental education (EE) in the school curriculum. The emphasis of EE lies, among other things, in promoting education through 'first-hand experiences' and 'hands-on activities' (McColaugh et. al., 1998). Botswana and other SADC countries are using Environmental Clubs to promote learning in conservation. Such clubs have been very instrumental in both facilitating the introduction of EE in the curriculum and creating awareness and understanding among the people on environmental conservation. Currently, Environmental Clubs, especially in Botswana, are the only way of exposing future teachers in the Teacher Training Colleges to pre-service training on environmental issues as the issues are not covered in the official pre-service training programs. This is a challenge to the Botswana education system, with specific reference to teacher training colleges of education. Upon completion of three years of training, teachers are expected to participate in the implementation and integration of EE across their respective subject areas, although they have had no grounding in the subject during their pre-service training.

The current situation in terms of formulating education policies and facilitating learning on EE is such that country-specific national education policies, protected areas EE programs and Environmental Clubs are being implemented in the different countries of the SADC region, and are tailormade to the needs of the countries in terms of promoting learning about conservation. The TFCA approach to conservation, which calls for joint management of natural resources, should also promote joint protected areas EE programs and intensive networking among Environmental Clubs in the SADC region. The challenge for the SADC region will therefore be to develop joint protected areas EE programs for the concerned TFCA countries, and promote networking

between environmental clubs in the concerned TFCA countries. There is a need to look at the expertise, resources, policies and so on in the region to determine whether the region is ready to face the challenge. This will also guide the region to develop strategies to enable SADC countries to cope with the challenge of developing and implementing TFCA areas EE programs.

Conceptual framework and definition of Trans-Frontier Conservation Areas (TFCAs)

The SADC Protocol on Wildlife Management and Law Enforcement (SADC, 1999) defines the Trans-Frontier Conservation Area (TFCA) as "an area or 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".

As can be seen from the above definition, the emphasis falls on promoting joint management of ecosystems and biodiversity among the TFCA countries as a measure to promote the sustainability of the resource. It is argued here that as much as the TFCAs advocate joint management of resources among the concerned countries, it should also promote collaboration among member countries in terms of developing joint protected areas EE programs for the TFCAs countries. It should also promote collaboration among environmental clubs in the TFCA countries in terms of sharing information and experiences on conservation.

The underlying philosophy of the TFCAs is that collaboration on resource management and conservation issues will spur increased collaboration between neighboring states, benefit conservation and lead to equitable sharing of the benefits derived from the sustainable use of shared natural resources. The primary purpose of TFCAs is to facilitate the conservation of biodiversity, and this is critical in situations where endangered ecosystems or species are shared between countries. TFCAs are also viewed as vehicles for the promotion of regional peace and stability, economic development and the preservation and enhancement of cultural values.

The establishment of the TFCAs in the SADC region is supported by two regional protocols signed by the SADC Heads of States. The first one is the SADC Wildlife Policy (SADC, 1997), which recognises TFCAs as a means of promoting regional cooperation in the management and sustainable use of ecosystems that transcend national boundaries. The second protocol is the SADC Protocol on Wildlife Conservation and Law Enforcement (SADC, 1999), which provides a framework for cooperation in the conservation and management of common natural resources and enforcement of the laws governing the use of these resources. The protocol has, as one of its specific objectives, "to promote the conservation of shared wildlife resources through the establishment of TFCAs". In addition to law enforcement, the latter protocol should also promote cooperation in the development and implementation of joint protected areas EE programs in the countries concerned.

As discussed above, the key goal of TFCAs is to promote collaboration and partnership in the management and conservation of biodiversity shared between two or more countries. The signing of the agreements, which is done at the highest level by ministers, should pave the way for further collaboration among the countries concerned, facilitating effective implementation of the TFCA conservation agenda. This includes collaboration among stakeholders in the relevant TFCA countries to facilitate further implementation of the TFCA strategy, and collaboration among governments, NGO's, the private sector and communities. It is at this level that collaboration among the TFCA countries concerning the protected areas' EE programs should occur. It is on the basis of this that this paper argues that subsequent negotiations and consultations regarding the implementation of signed agreements should take on board the need for collaboration in developing the protected areas' EE programs and undertaking environmental club activities in the concerned TFCA countries. Progress in this direction has been slow or non-existent, as it is now over six years since the first agreement was signed between Botswana and South Africa and little has been done in terms of promoting collaboration for joint protected areas EE programs. To cite the Botswana situation, the implementation and integration of EE is taking place at the primary education level, and very little or none at secondary education level, thus creating a gap between these education levels.

Protected areas EE program: The Botswana approach

The question that readers might be asking themselves could be, why this concern about TFCAs and protected areas EE programs? The answer lies in the fact that TFCAs are an expansion of the country-specific protected areas, and these have contributed significantly to promoting outdoor EE in the region in the past. It is very important to assess the extent to which the TFCA approach will affect the contribution of the protected areas EE programs in promoting education for sustainability, and to come up with strategies to address the challenges. Outdoor EE has always been among the key conservation strategies for the protected areas under Botswana's Department of Wildlife and National Parks and an important learning/teaching strategy for the Association of Environmental Clubs of Botswana. The authors of this paper, who are from the above two organisations, endeavour to share ideas and experiences with colleagues from other countries on the anticipated effects of TFCAs on the role of protected areas EE programs in promoting education for sustainability.

The key function of the protected areas EE programs, especially in Botswana, is to promote education through 'first-hand experiences' or 'learning by seeing', which falls under the second and third pillars of Environmental Education. The two pillars are that of promoting 'education *in/through* the environment', and 'education *for* the environment' (UNESCO, 1977). The two pillars lean more on the use of the outdoor environment as a learning resource in promoting learning on EE (Shaw, no date). In Botswana, the goal of using protected areas to facilitate environmental learning, especially using

the approaches emphasised in the above two pillars of EE, mainly aims at bringing about a change in attitudes on environmental conservation, enhancing understanding of the environmental issues usually discussed theoretically in schools and workshops, as well as mobilising people to take action to address environmental problems. This has always been done in isolation, within country-specific protected areas EE programs. The TFCA approach to wildlife conservation and management, which emphasises joint management of natural resources as the key to the sustainability of the resource, should also promote the formation of joint protected areas EE programs for the countries involved.

The Tbilisi Declaration laid an important foundation for global environmental education programme development by formulating EE guiding principles and the three broad objectives of EE (UNESCO, 1977) – "education *about, in/through and for* the environment" (Shaw, no date). The protected areas EE programs in Botswana, which tends to favour the use of the outdoor environment as a learning resource, falls under the second pillar of EE, that of 'education *in/through* the environment', which emphasises going out into the environment to learn from the environment itself as a learning/teaching resource, as well as 'education *for* the environment', which emphasises advocacy for the environment (the development of positive feelings, commitment and the desire to address environmental problems). This is because through the programme people learn on-site, experience the issues and problems 'first-hand' and feel the impact, effect and magnitude of the problems.

Opportunities for promoting education through Protected Areas in Botswana and the SADC Region

Botswana and other SADC countries are very fortunate in that they have a rich wildlife and scenic heritage that has contributed significantly to the livelihoods and economic development of the countries through tourism. To further complement the efforts, the countries have set aside vast areas of land as protected areas, with 17% or 100 000 square kilometers of the total land area set aside for National Parks and Game Reserves in Botswana (GOB, 1985). It is very important to ensure that these areas are put to good and effective use to promote learning on conservation through the use of the outdoor environment. There are indications, especially from Botswana, that the areas have not been used effectively to promote education *in, through* and *for* the environment, as the educational excursions to the protected areas have mainly been more 'touristic' than educational. It is a challenge for the protected areas EE practitioners to intensify their approaches in order to make the programs effectively promote learning on conservation in Botswana and the SADC region.

The SADC region boasts supportive environmental Non-Governmental Organisations (NGOs), partners in the private sector, communities and individuals who have also established sanctuaries, game ranches, farms and educational game reserves to promote education for

sustainability. In Botswana there are about six (6) private educational game reserves owned by NGOs, the private sector and communities. Game farms and ranches have also been established, which provide an added opportunity for promoting outdoor learning on EE in Botswana and the entire SADC region. The TFCA approach to conservation that is currently sweeping through the SADC region also provides another opportunity for the region to develop joint protected areas EE programs in the countries concerned. The TFCA strategy should bring about collaboration, networking and partnership in the implementation of protected areas EE programs for the countries involved, in the same way as it has brought about joint management of biodiversity.

The benefits of collaborating in promoting joint protected areas: EE and Environmental Club programs in TFCA countries

The implementation of EE needs collaboration and partnership among the different stakeholders nationally, regionally and at global level. It also requires expertise and resources which are not readily available in several countries, including the SADC region. Collaboration and partnership in terms of promoting the TFCAs' EE programs, which will be brought about by the TFCA strategy, will ensure sharing of expertise and resources among the countries involved. This will facilitate effective implementation of joint protected areas EE programs.

The TFCA strategy, which also promotes the free movement of people in the TFCA countries concerned, will also bring about networking and the sharing of information on and experience of EE among environmental clubs, students and teachers. This will help enrich the EE teaching and learning process. Communities in the TFCA countries will also have the opportunity to share ideas and experiences on wildlife conservation and conflict management. Collaboration and networking between different TFCA countries will greatly assist in the development of a rich EE curriculum for the preparation of teachers at teacher training institutions.

Challenges for developing joint Protected Areas EE programs and networking for Environmental Clubs in the concerned TFCA countries

The development of protected areas EE programs is a difficult and challenging undertaking, especially since its implementation involves several stakeholders. In Botswana, these include the Ministry of Education, the Ministry of Environment, Wildlife and Tourism, Environmental NGOs, the private sector and donor agencies. The TFCA strategy in the SADC region offers a good opportunity for the development of joint protected areas EE programs, but will also have to overcome several challenges. Collaboration and networking among the countries concerned will be among the key strategies to address these challenges.

The other challenge for the region in terms of developing joint protected areas EE programs based on the TFCA

conservation strategies will be to harmonise and/or realign the environmental education policies and strategies of the countries involved. There will be a need for the legislation on protected areas' EE programs of different countries to be harmonised through collaboration and networking. What will be needed is a joint TFCA Working Group or committee for the protected areas' EE programs, with either Ministries of Environment or selected environmental NGOs as conveners.

In terms of networking and collaboration among environmental clubs in the TFCA countries of the SADC region, one can only hope that the TFCA strategy will re-invent the wheel. The introduction of wildlife clubs, nature clubs and environmental clubs in the region, especially Botswana, was based on their success in countries such as Tanzania and Kenya. The TFCA approach to wildlife conservation could therefore bring about the needed collaboration and networking among clubs in the TFCA countries. Once again there will be a need for the countries concerned to establish joint environmental clubs committees to facilitate networking among the clubs in the region. There will be a need to identify a convening organisation for committee meetings in the concerned TFCA countries.

Recommendations
*   The need for the TFCA countries to put in place strategies that will promote collaboration and partnership in terms of implementing the protected areas EE programs; partnerships at all levels: governments, NGOs and private sector.
*   The need for EE Clubs in the countries concerned to network and share information and experiences in terms of using protected areas as outdoor EE learning resources.
*   The need for the training of staff in EE on the basis of the challenges introduced by the TFCA approach to conservation.
*   The need for collaboration and partnership among TFCA countries in terms of implementing people/ protected areas extension programs and promoting the sharing of information and experiences on sustainable utilisation of natural resources.
*   The need for the TFCA countries to develop an EE curriculum for pre-service teacher training. The latter will eventually address the issue of lack of continuity on EE issues between education levels.

Conclusion
The holistic nature of environmental education demands partnerships for it to be effectively implemented. The protected areas EE programs have contributed significantly to enhancing understanding on environmental issues and problems, as well as in mobilising people to participate in addressing environmental problems. This has been done by exposing people to 'first-hand experiences' on the issues and problems usually discussed theoretically in schools or workshops, thus linking theory to practice. The platform has also been effectively utilised by environmental clubs to

reinforce EE in classroom learning, especially in Botswana.

The TFCA strategy of wildlife conservation offers a good opportunity for collaboration and partnership in the development and implementation of joint protected areas EE programs in the SADC region. This has not been taken advantage of, especially in Botswana, despite the country already having signed three agreements for the establishment of the TFCAs. Strategies need to be formulated for using the TFCAs to promote joint protected areas EE programs, and to enable the SADC region also to respond to the global call for the promotion of education for sustainability.

It has been argued in this paper that the TFCA strategy of conservation offers opportunities for the development of joint protected areas EE programs. This will, of course, not come without challenges, and this paper has outlined some of the expected challenges, which will include the need to harmonise different countries' policies on protected areas EE programs.

Finally, the paper challenges environmental practitioners, professionals and researchers to be always on the look-out for emerging development initiatives that could adversely affect the success of current environmental education methodologies and approaches. An awareness of such challenges will enable us to come up with strategies to effectively respond to them, thus ensuring the continued promotion of education for sustainability for the world population. Remember that the world is looking to conservationists to provide leadership in caring for the environment. We should not disappoint them.

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6 Communication across continents: Integrating local and global understanding in ESD

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Abstract

One of the ESD goals is the development of awareness and understanding of local and global environmental issues and cultures. This paper investigates how online communication among youth teams from two countries contributed to achievement of this goal. In fall 2006, two youth groups in the USA and two school classrooms in Russia implemented the Garden Mosaics program. In addition to their local investigations, youth used blogs for learning from each other about environmental and cultural issues (http://gm-baltimore-tomsk.blogspot.com; http://gm-bronx-tomsk.blogspot.com). They learned about the environment in another country and developed skills to present local environmental information.

Introduction

Whereas education scholars have defined a broad agenda for education for sustainable development (ESD), and have suggested that its content be adapted for different contexts (Bonnett, 1999; Bhandari & Abe, 2003; Lotz-Sisitka, 2004; Bory-Adams, 2006) and that it needs continual re-conceptualisation (Fien & Tilbury, 2002), they also have set forth several common goals for ESD-aligned programs (McKeown, 2002; McKeown and Hopkins, 2003; Fadeeva, 2007). For example, ESD programs should develop in youth:

1) **Knowledge** about local and global environment, society and economics;
2) **Skills**, such as critical and system thinking, creativity, visioning, communication skills, ability to conduct inquiry activities and participate in local affairs;
3) **Values** and understanding of their communities, sustainability, intergenerational respect and appreciation of diversity (Hopkins & McKeown, 2002; Cloud, 2005).

This paper argues that online communication with peers from other countries can help youth achieve some of the aforementioned ESD learning outcomes.

A number of education programmes, including iEARN, Young Minds, and Global Virtual School for Sustainable Development, connect youth from classrooms in different countries via the Internet to help them collaboratively explore and share knowledge about science, community, environment, health, or other issues. Some of the goals of these programmes are teaching youth about science, developing their computer skills, and engaging them in cross-cultural collaboration and local actions (Rennebohm-Franz, 1996; Jobson, 2001; Simovska & Jensen, 2003); these goals are clearly parallel to some of the ESD goals mentioned above.

At the same time, many education programmes provide local and global environmental and sustainability curricula, but do not include international collaboration activities via the Internet. This creates a need to investigate whether including an online exchange in these educational programmes can help facilitate sustainability education. More specifically, we address the following questions:

- How can online communication among youth from different countries participating in similar educational activities help them to learn about local and global environmental issues, and thus achieve some of the ESD learning goals?
- What skills and values do youth gain from online communications with foreign youth?
- How can educational programs from different countries benefit from linking their educational programmes?

This research project was conducted with the participants of the Cornell University Garden Mosaics (http://www.gardenmosaics.org), an outreach education programme that engages urban youth in learning about environmental science in community, intergenerational and multicultural contexts. Youth conduct inquiry activities in community gardens and in their neighborhoods, and then report their findings to databases on the Garden Mosaics website. Since 2001 this programme has been implemented in multiple informal and after-school education programmes in the USA, Canada, South Africa and Russia.

Participants and Methods

Education programmes in the USA and Russia

To determine if young people could benefit from communication with foreign peers, Garden Mosaics conducted computer-mediated communications among 10-16 year-old youth from two educational programmes in the USA (10 young people in the Bronx and 10 in Baltimore) and two programs in Russia (8 and 10 youth, both programs in Tomsk). The Russian teams were part of after-school programmes in public schools, and the American teams were from community-based educational programmes, one of them targeting Latino youth and the other African-American youth. During fall 2006, all four teams implemented the Garden Mosaics investigations, including the Gardener Story, Neighborhood Exploration and Community Garden Inventory.

Communication via blogs

Web blog technology was used to connect youth from the USA and Russia while they participated in the Garden Mosaics activities in their countries in October-November 2006

(http://gm-bronx-tomsk.blogspot.com, http://gm-baltimore-tomsk.blogspot.com). The goals of the online exchange were help youth to: 1) learn about local and foreign urban environmental issues and culture, 2) develop communication skills, and 3) develop an appreciation of their own and other cultures. A plan for the online communication requiring at least one weekly posting about the youth teams and their Garden Mosaics activities were sent to the participating educational programmes. During the six-week period that they participated in the Garden Mosaics activities, the youth reported their findings on the blog and on the Garden Mosaics *i-m-science* online database, and sent each other questions and comments via the blog. Youth used the blog messages to describe their teams, cities, urban green spaces and inquiry activities. English was the language of communication; the Russian youth had studied English in school. The blog facilitation took about 50 hours, which included developing the blog schedule, instructing the American and Russian educators how to use it, and helping educators and youth to post messages.

Methods
The following methods were used to evaluate the youth and educational programme outcomes in terms of achieving ESD learning goals:
- *Participatory observations*. The blog facilitator (Alexey Kudryavtsev) visited schools in Tomsk to help youth and teachers learn about the Garden Mosaics learning activities and blog technology. He then observed these young people when they participated in some of Garden Mosaics activities and when they posted messages on the blog in computer classes.
- *Document review*. Content of messages on the blog was an additional source of information to evaluate youth learning.
- *Surveys*. Russian and American youth and educators were asked questions about learning outcomes following the online communication. All participating Russian youth (21) and the Bronx youth (10) returned surveys; surveys from the Baltimore program (10) were not received. Four educators in Russia and one educator in the Bronx filled in educator surveys; the survey from the Baltimore educator was not received.

Results
American educators already had experience with Garden Mosaics youth activities, and had to learn only how to incorporate the blog into their programmes. Russian educators were implementing this programme for the first time, so in addition to learning how to use the blog they also had to learn about the Garden Mosaics activities. During implementation of the activities, the Russian educators conducted computer sessions with young people once or twice a week to help them write up their experiences, post texts and images on the blog, and communicate with peers oversees. The Russian teachers had minimal computer skills, so some computer savvy young people helped them post educator messages. One

of two Russian schools had limited access to computers and the Internet, which significantly impeded their participation in the blog. American educators were more computer savvy, they helped their programme participants to post messages on the blog, and their programs had unlimited access to the Internet. After this project all educators said that the schedule was quite tight for both American and Russian youth, who were asked to conduct at least two or three types of the Garden Mosaics investigations within six weeks.

Outcomes in Russian schools
Team work
Collaborative work was an important outcome itself because youth in most Russian schools do not offer many opportunities for group projects in school or after-school settings. Educators in both Russian schools reported that computer activities such as blogging and posting results of investigations on the *i-m-science* database, helped them to facilitate collaboration among youth of different ages (upper-middle and high school) because the activities, such as writing messages about their investigations, selecting images, posting messages and giving feedback, required division of tasks and coordination. The Russian educators also mentioned that use of computer technologies helped to engage some young people who otherwise would not be willing to participate in environmental education projects.

International learning
Russian youth demonstrated interest in environmental issues abroad and were surprised that American youth developed a such a strong sense of ownership of their communities: "*People in America care about their environment and culture*"; "*I liked to learn that American kids take care of their environment*". Russian youth also were very surprised to learn from the blog about the unsafe urban environment in Baltimore: "*I learned that because of high level of crime it is dangerous to walk in the city [Baltimore], and gardens are the only place where people can relax and stay safe*". At the end of the blogging period about half of the Russian youths mentioned orally that now they better understand people from a different country.

Communication
Nearly all of 21 Russian youth had a chance to learn how to present their information for an international audience and how to post messages on the blog. Four of them, however, said that they wanted to experience more personal communication with the American youth, i.e., send messages individually to different youth. The same youth and two Russian educators also expressed willingness to participate in real-time video conferencing with foreign teams. Although one of the American educators also suggested trying to use voice conferencing among the USA and Russian teams, it was not possible because of slow internet connection in Russian schools at the time of this project.

Outcomes in the USA educational programs

Because the American educators had conducted Garden Mosaics previously, they were able to compare this programme with and without the online exchange. One of educators mentioned in personal communication that the blog had been very inspirational for youth because they had a chance to reflect about their communities, share information about their environmental activities, and answer questions from foreign peers.

Connecting with the outside communities

Although both American education programs were located in vibrant and ethnically diverse communities, the educators were concerned about the limited opportunities their youth have to connect with the outside word: *"The more my youth can communicate with people beyond their local environment it will help them develop a global perspective. My goal is to break down the narrow outlooks that so many African American children have. Most urban African American children are locked into a ghetto universe of hopelessness and despair."* The other American educator mentioned that without the programme their youth would not have had an opportunity to communicate with youth from different countries, nor present information about their own cultures and environment: *"They learned about another reality, whose existence they would have never dreamed of. Also they had a great time learning more about their own reality and having fun at the same time".*

International learning.

Similar to the Russian students, the US youth reported that they enjoyed communication with their foreign peers; it was the first experience of this kind for all of them. Posts on the blog and answers in the survey indicated that the Bronx youth learned about foreign social issues: *"They also have immigrants the same as us. Maybe immigration comes from different countries, but still that is a topic that we share".* Learning about other environment was also meaningful for youth: *"This blog has shown us [...] an environment that we did not know";* *"We thought that they would have unknown vegetables and fruits. They might, but still we share a considerable common variety of them".* Similar to Russians, the Bronx youth mentioned that they achieved better understanding of foreign culture: *"At the end of this blog we realized that we share more common things than differences";* *"Even though we are from two different countries and have different customs we are united by our desire of having a better world where to live".*

Discussion and Conclusion

The purpose of this study was to investigate how online communication among youth teams from different environmental educaional programmes addresses ESD learning goals. Results of this research suggest that educational programs that include international collaboration using the Internet give youth from different countries the opportunity and encouragement

to embrace and honor common experiences and perspectives (Rennebohm-Franz, 1996), and it also has contributed to learning about global environmental and social issues, which are integral to ESD. Besides making connections beyond their neighborhoods, youth presented information about their environment for an international audience, which forced them to take a new look at their own communities. In particular, communication via the blog encouraged youth to search and integrate knowledge about the history, environment, economy and people of their communities, which represents some of the core content of ESD (Corneya & Reid, 2007).

Some papers indicate that collaboration in virtual groups may have significant potential for co-construction of knowledge (Gabriel, 2004), which is embraced by ESD. However, in this project the short period of computer-mediated communication (only six weeks) and the simple blog environment (non-threaded conversations) did not provide a good opportunity for in-depth online collaboration among international teams. Nevertheless, youth had an experience of working in teams within their educational programmes; each of them worked on different Garden Mosaics investigations, and then had to work together to merge their information from different activities for uploading on the blog.

Another question of interest was how online technologies can be incorporated in ESD programmes. The youth used the Internet when they looked for online educational materials (*Science Pages*) in the beginning of the programme, and when they reported results of their investigations at the end of programme. Online communication in this project forced youth to use computers many times during the course of the programme, and it helped them to develop communication skills, another important goal of ESD. The choice of blog technology for communication among teams was informed by the cost of its use (it was free), intuitive and "fun" design, and the ability to post images in bodies of messages, although it did not support threaded conversations. Many other kinds of creative asynchronous (e.g., Internet forum) and synchronous communication technologies (e.g, chat, audio and video conferencing) are free and could be incorporated into environmental education programmes. Educational programmes can also join established networks (like iEARN), which require a membership fee but provide benefits including allowing groups to easily find peers for collaboration in different parts of the world. The role of other technologies (e.g., wiki and Google My Maps) that can facilitate collaborative learning among youth from different educational programmes is a subject for future investigation.

Results of this research indicate that computer-mediated international exchanges, when combined with local hands-on investigations and other activities, may

contribute to youth understanding of their own and foreign social and ecological communities. Whereas the local investigations, including posting the results to the blog, facilitated collaborative learning among youth at a single site, it appears that the blog did not promote collaborative learning or co-construction of knowledge across sites in different countries. Future programmes using more interactive technologies may facilitate such learning and collaboration. As educators look at ways to implement ESD, attention should be paid to using computer-mediated communications as a means to address ESD goals related to knowledge, skills, and values, and as a way to promote global understanding without sacrificing place-based education or learning about local biological and cultural diversity.

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Crossing boundaries – competence-based learning for sustainable development in a virtual mobility setting

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Abstract

To contribute effectively to sustainable development, professionals should have the competence to communicate and collaborate across the traditional boundaries of, for example, discipline, nation or culture. Important ingredients of competence-based learning environments for sustainable development are therefore cross-boundary contexts and group work, with international student mobility as a prerequisite. An alternative to costly physical mobility schemes in higher education is 'virtual mobility', using e-learning environments that allow time and place independent communication and collaboration at low cost. Two successful examples of competence-based learning environments for sustainable development in a virtual mobility setting are presented and their perspectives discussed.

Introduction

Higher education is currently facing two major challenges. The first challenge concerns the emergence of the knowledge society and the second challenge the widely acknowledged need to achieve sustainable development globally (Bereiter, 2003; UNCED, 1992). To be able to participate in today's knowledge society and contribute to sustainable development successfully, students need to develop attitudes, knowledge and skills which the traditional system of higher education often does not provide. In the knowledge society, professionals should possess integrative competences rather than disciplinary separated knowledge with a limited shelf life. Learning environments in higher education are therefore increasingly geared towards competence development, with a problem-oriented approach, an authentic context and active, often collaborative knowledge construction as major ingredients. The implications for learning for sustainable development in higher education are that the focus should rather be on identifying competences and developing appropriate learning environments, than on defining the exact type of knowledge students should acquire. In this paper, we propose a set of key competences for sustainable development and argue that a virtual mobility setting, exploiting collaborative e-learning tools, offers an excellent learning environment to develop these competences.

Competences for sustainable development

The term 'competences (or competencies) for sustainable development' is not yet commonly used. However, in the context of education for sustainable development (ESD), there is extensive literature on what should be taught and learned in terms of knowledge, skills and values (see IAU, 2006). Prominent attention to values stands out in most of the literature, including publications addressing higher education. The underlying idea is that value-education, and – as an outcome of that - a change in attitude is needed to prepare the students for a role as 'agents of change', able and willing to transform our current society into a more sustainable version (e.g. UNESCO, 1997; Rowe, 2002). The exact nature of these values and attitudes depends on the ideological point of departure and its perspective on what a sustainable society should look like.

What is strikingly absent in these approaches to ESD, is the notion that there may be a valid diversity in perspectives on sustainable development. This is all the more remarkable as one of the most prominent features of the concept of sustainable development is the many different ways in which it is interpreted. This diversity seems inevitable, given the global scale and complexity of sustainability problems and the many uncertainties that surround them. In a pluralistic approach, one accepts this diversity as valid, i.e. stemming from different but equivalent value systems that result in different but internally consistent perspectives on sustainable development. Even if one would reject the equivalence of different value systems and advocate a superior perspective, one should realise that in an open democracy plurality is a fact of life. It is unlikely that nationally or even globally the majority of the population could be converted to a single 'superior' perspective through (higher) education. The diversity of perspectives among teachers alone would already be prohibitive. Therefore, instead of ignoring this diversity, we explicitly take it as our point of departure when defining key competences for sustainable development.

The diversity of perspectives can be valued positively for several reasons. The thrust of sustainable development is to prevent as much as possible shifting the burden of improvements in one domain or for one group to other domains or groups. Taking a diversity of perspectives into account will thus provide a sharper eye to detect such shifts, and may result in more balanced decisions. Multiple perspectives could also enable a richer definition of complex sustainability problems and produce a wider array of potential solutions, which, in the face of uncertainty, enhances the probability to find adequate solutions (Janssen and Osnas, 2005).

However, the diversity of perspectives also entails a risk of conflict, political paralysis and a lack of societal support at a time when joint, large-scale measures may be urgently needed (Keulartz, 2005). Such situations are

likely to occur, because, despite intentions to prevent unjust shifts of costs, some groups are bound to win (or lose) more than others.

Diversity in perspectives thus creates the need for negotiation and dialogue or social learning, to arrive at richer, more complete definitions of sustainability problems, a wider array of potential solutions, and more balanced, broadly supported measures.

In the context of higher education, we define competences for sustainable development as those combinations of knowledge, skills and attitudes that enable graduates to effectively contribute to transition processes towards a (more) sustainable society, on the basis of their domain-specific expertise and more general academic competences. As outlined above, the ability to deal with a diversity of perspectives is crucial in such transition processes. We therefore argue that the key competence for academic professionals to successfully contribute to sustainable development will be their ability to think, communicate, learn and collaborate across the boundaries that divide these perspectives. We refer to the ability to cross such boundaries as 'transboundary competence'. This ability is essential as it will be impossible for students to develop a 'super-perspective' and become a 'sustainable development specialist' with a comprehensive combination of knowledge, skills and values. Rather they will, as graduates, contribute to sustainable development, often in team work, on the basis of their own values, individual talents and specialised expertise. To do that effectively, however, they should be aware of their own limitations, acknowledge the diversity of perspectives, and be able to think across boundaries and build bridges between their own perspective and that of others (Keulartz et al., 2004).

Major boundaries to be crossed when contributing to sustainable development are those between:
- parts or sub-systems;
- disciplines;
- science and other societal domains;
- nations or cultures;
- local and global scales;
- short and long-term (time scales);
- conventional and innovative approaches.

Transboundary competence thus comprises the abilities to take a whole systems-oriented, interdisciplinary, participatory or transdisciplinary, international, cross-cultural, cross-scale, future-oriented, and creative approach to sustainability problems. Of course, the degree in which all these abilities will be developed may vary among students and study programs.

Competence-based learning for sustainable development
The concept of competence-based learning has been developed over the past decade and has gained ground as a dominant educational approach in The Netherlands. Its development was a response to the requests of the labour market and the wish of educators to make formal education more meaningful and relevant. The idea is that learning should focus on integrative competences required in professional life, and not on the acquisition of isolated skills and pieces of knowledge. The best way to acquire these competences appears to be in a learning environment that combines actual practice ('learning by doing'), and explicit reflection on what and how to learn from that practice ('learning by reflection') (Könings et al., 2005). 'Learning-by-doing' involves that the learning environment is realistic or authentic in terms of the problems the students have to solve, the tasks they have to perform, and the context of these

Table 1. Characteristics of a competence-based learning environment applied to learning for sustainable development. For a detailed explanation see De Kraker et al., 2007.

General feature	Application to learning for sustainable development
realistic problems or cases	• ill-structured problem description • multiple scale, multiple domain issues
realistic tasks or roles	• open-ended • active integration of different aspects of problem and knowledge from different domains • thinking and reasoning across diverging scales of time and/or space • stimulating creative solutions • dealing with multiple perspectives on the problem
realistic context	• heterogeneous student groups (multidisciplinary, multi-cultural, international) • open learning environment, interaction with experts, clients or stakeholders from outside university
explicit reflection on task performance and learning	• reflection on quality of products in relation to quality of processes and learning strategies • reflection on processes in heterogeneous groups (negotiation, social learning) • individual reflection complemented by group discussions and organised feedback (preferably also from outside the university)

tasks. 'Learning-by-reflection' requires that students explicitly reflect on their learning goals, activities, results and ways to improve.

Based on these principles, the characteristics of an 'ideal' learning environment for sustainable development, fostering transboundary competences, are defined in Table 1. In a traditional educational setting, such a learning environment with cross-boundary contexts and group work as major ingredients is difficult to realise. It would require a high level of international student mobility to bring students from different disciplinary, national and cultural backgrounds repeatedly together at the same time, at the same place. An alternative to costly physical mobility schemes in higher education is 'virtual mobility', using electronic learning environments. E-learning or, more precisely, computer-supported collaborative (CSCL) learning environments provide an innovative and almost ideal solution to the problem, as the modern ICT-tools they exploit allow time and place independent communication and group work (Ivens et al., 2002).

In the next sections, two successful examples of competence-based learning environments in a virtual mobility setting are presented and their future perspectives discussed.

Two Succesful Models: Virtual Seminar and Virtual Company

European Virtual Seminar on Sustainable Development
In an academic context, the term 'seminar' traditionally refers to a group of students or scholars studying (scientific) problems under the guidance of a teacher or expert. In a 'virtual seminar', the communication among the members of the study group and between the students and their teacher is supported by internet-based computer conferencing technology. This means that in principle all communication within a virtual seminar can be time and place independent.

Inspired by encouraging experiences gained in the Global Seminar on Environment and Sustainable Systems (www.globalseminar.org), the Open University of the Netherlands and the European Copernicus Charter network of universities developed a 'European Virtual Seminar on Sustainable Development' (EVS, for details see Cörvers et al., 2007). Since the pilot project in 2001, the EVS has been organised once a year, and the number of participating institutions has gradually risen (Table 2). At present (2007), the network consists of 20 partner institutions in 13 European countries.

Table 2. Institutions and students participating in the European Virtual Seminar

Year	No. of institutions	No. of countries	No. of student groups	No. of case studies	No. of students enrolled	No. of students passing
2001	9	4	6	3	59	43
2002	11	5	6	4	45	30
2003	15	9	11	5	61	37
2004	18	11	13	5	78	41
2005	12	9	10	5	68	41

The aim of the EVS is to foster an international, multidisciplinary dialogue on sustainable development among students from all over Europe. The EVS confronts students directly with divergent peer views on sustainable development, and their implications for a societal shift towards a more sustainable Europe. These differences in student views depend on differences in the social, economic, political, cultural or environmental contexts in which the students live. The learning process in an EVS differs greatly from that in mainstream education. There are no lectures in an EVS, the students have to work on case studies in international, multidisciplinary groups, the group members cannot organise face-to-face meetings, and all collaboration and social processes depend on communication using modern ICT.

The overall theme of the case studies is sustainable development in Europe. In the EVS, a case study is an open problem description that invites students to seek the best possible solution. Each student group works on one case study. They have to formulate a problem description, write a research proposal, select information from a range of sources and integrate these with current theory

to devise the 'best possible' solution to the problem. Their work culminates in a group report, in which they operationalise the main terms in the case study, produce a group definition of sustainable development, integrate the views of the group members (from a range of cultural and disciplinary backgrounds) on the problem, and produce a policy summary for the defined target group (i.e. the stakeholders). The students reflect on their learning process at various points during the seminar and produce both individual and group reflection reports.

The computer conferencing system used for the purpose of the EVS is the Blackboard Learning System. All EVS course materials are accessible via Blackboard. What is more important for the EVS, however, are the tools for communication and interaction. The students can use electronic discussion boards, e-mail facilities, virtual classrooms and chatrooms, as well as a tool for file exchange between group members. In the educational format, the emphasis is on asynchronous communication using pre-structured group discussion boards between group members (and their tutor). The risk of long delays in communication between students

is minimised by the adoption of a clear set of rules.

The organisational model for the EVS is based on a network of higher education institutions sharing expertise and investing staff time and resources. It is a bottom-up approach without formal, top-down institutional arrangements. A core of active and experienced partner institutions is needed in order to sustain the EVS. The success of the EVS proves that a bottom-up approach without any external funding can work, as the network has undergone substantial enlargement since 2001.

Virtual Environmental Consultancy
A 'virtual company' is an educational setting in which learning and work experience have been fully integrated in an electronic learning environment. The learning environment resembles an authentic professional situation. At the Open University of the Netherlands, the virtual company concept was introduced in the late 1990s and has since been developed further and extensively evaluated (Westera & Sloep, 1998; Westera et al., 2000; Bitter-Rijpkema et al., 2003). The most successful version is the Virtual Environmental Consultancy (VEC), which is part of the university's study program in Environmental Sciences (for details, see Ivens et al., 2007).

The aims of the VEC are two-fold. The first aim is to equip the students with the competence to communicate and collaborate with others in the field of environment and sustainability, such as colleagues from different disciplines, specialists, private and public clients. The second aim is to develop the students' ability and attitude to learn 'life-long', as in the fast developing field of environmental issues, professionals have to come up with new solutions to new, complex problems time and again.

The external 'real' world plays an important role in this educational format. To make the learning environment authentic, students have to carry out *real* projects for *real* clients. Typical clients are governmental (local, provincial or state) and non-governmental agencies, public sector institutes and sometimes private sector companies. Projects generally concern questions which are in an early stage of definition, and which can typically be answered by means of desktop studies.
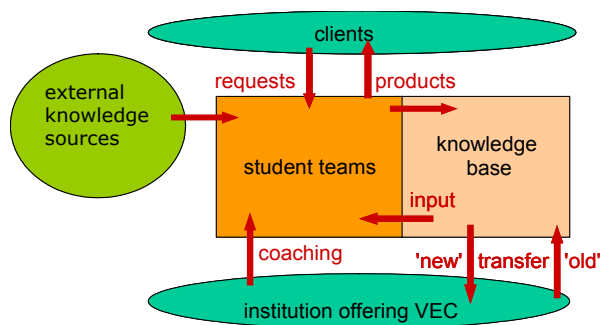
Figure 1. General structure of the Virtual Environmental Consultancy

The general structure of the VEC is presented in Figure 1. The core element in this structure is that of student project teams (Figure 1), carrying out projects commissioned by clients. They do so using a knowledge base consisting of information already present in the VEC or by using input available from the outside world. The knowledge base initially receives some input from materials available at the institution that offers the module. Further new knowledge is added from the work carried out in the external projects. The institution offering the module provides coaching for the project teams and individual student employees. The results of each project are delivered to the client.

The VEC is not restricted to a fixed location on the premises of the educational institute offering the module, it is located in 'cyberspace', i.e. mediated via a computer network. It thus allows for virtual mobility of the Open University's students, which live geographically dispersed over the Netherlands and Belgium. The web-based office is the heart of the consultancy. Actually, it is not one room but a set of many rooms for project teams and working groups, departments in the virtual consultancy agency (e.g. helpdesk, training centre, knowledge base) and individual rooms for individual portfolios. In this groupware-based environment, the employees can place and share documents, organise discussions and pose questions. It also offers generally accessible files, for instance on project results, fact sheets, a database recording employees' presence, and so on.

Students are generally enthusiastic about the VEC. They find it a stimulating and productive environment, and particularly appreciate the interaction with the 'real' outside world and the feedback on their performance.

Conclusion and Future Perspectives
Both the European Virtual Seminar (EVS) and the Virtual Environmental Consultancy (VEC) have many of the characteristics of a learning environment for transboundary competence listed in Table 1. There is a clear difference in focus, however. The virtual seminar aims to establish a dialogue among students and targets primarily their abilities to think and communicate across boundaries. In EVS this concerns the boundaries between disciplinary and national perspectives. The focus is on arriving at a shared perspective on the problem and possible solutions. The virtual company deals with actual problem solving. Central to this type of learning environment is the ability of the students to collaborate across boundaries. In the VEC, this not only concerns the boundaries between different disciplinary backgrounds within the student teams, but, more importantly, also between a student team and actors from outside the university (clients, professional experts and occasionally stakeholder groups).

A combination of EVS and VEC, with international, highly multidisciplinary student teams working in a transdisciplinary way on complex sustainability problems for real clients and involving multiple stakeholders,

would theoretically result in an almost ideal learning environment for sustainable development. However, inclusion of all these elements would make it a tremendously complex learning environment to students and staff. The current formats of EVS and VEC represent about the maximum level of complexity students can cope with. More complexity, in the problems, in the communication between team members, in the interactions with the outside world, would most probably reduce the effectiveness of the learning environment. Clearly, the goal of one single ideal learning environment in which all competences for sustainable development can be developed is far too ambitious. It will be more realistic to try to achieve this at the level of the curriculum, with a variety of specialised learning environments each focussing on the development of a limited set of competences.

A recent development is the introduction of more explicitly cross-cultural aspects in both a virtual seminar and a virtual company learning environment for an international Masters Program on Sustainable Development and Management by OUNL and universities participating in the ELAN network (European-Latin American Network for Sustainable Development, www.uni-lueneburg.de/infu/alfa/en/). In a pilot version, a team of Dutch students conducted a consultancy project for the Argentinian provincial government of Mendoza. In this case, the added complexity of the cross-cultural aspects was compensated by the more homogeneous composition of the student team.

Another recent development is the upscaling of the virtual seminar approach of the EVS to a Virtual Campus for a Sustainable Europe by a consortium of European universities (eacea.ec.europa.eu/static/en/elearning/compendia2006/documents/ vcse.pdf). The objective is to promote sustainable development by virtual mobility of students within the European Union.

It appears that 'virtual mobility' approaches to learning for sustainable development, as presented in this paper, are not only preferable on educational grounds. The required technology for time and place independent communication and collaboration is currently widely available, inexpensive and yet powerful. It is thus within reach of higher education institutions across the globe and this low-cost technology enables a 'bottom-up' organisational model, which can be easily expanded to include more partners without the need for external funding. Moreover, the flexible nature of the 'virtual mobility' approaches makes them relatively easy to fit in with existing modes of curricular organisation. We expect therefore a widespread adoption and, of course, adaptation of these approaches in learning for sustainable development.

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7 More Power to Environmental Educators — More Tools for Transformation

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Abstract
Every aspect of the biosphere is being degraded, driven by the world's best educated citizens. This crisis demands that today's students graduate as agents of radical change. Educators need extra tools to foster this transformation. Research and experience in community sustainable development and the 'greening' of Upper Canada College in Toronto, Canada, suggest these transformative teaching tools: (1) ecological ethics; (2) nature-bonding experiences in the early years; (3) life as 'great story'; (4) evolution-ecology-biodiversity-ecosystem services as a continuum; (5) environmental math and ecological economics; (6) eco-inclusive scientific literacy; (7) environmental history; and (8) sustainable development learning in action.

Introduction
All education is environmental education.
—David Orr

The best educated citizens of the best educated nations in the world are using their best skills to knowingly record in ever greater certainty and detail their accelerating destruction, degradation and deadly pollution of every aspect of the biosphere (Tickell, 2006). This tragedy both motivates and challenges environmental educators, who could do with some additional tools for rapid and radical transformation.

The common factor in the many barriers to environmentally responsible remediative action is that the influential EuroAmerican culture's mindset sets it apart from Nature (Johnston, 2003). Orr (1992), amongst others, laments that the EuroAmerican culture does not question whether it is educating for "an active, ecologically competent citizenry" (p. 28), and has said that we still educate at all levels as if no sustainability crisis existed (p. 83). Orr implies that Nature is taught out of children by what is omitted from their education. Teachers are called to consciously be making Nature live again in the hearts and minds of students.

This paper is derived from qualitative master's research into barriers to environmental action and 'sustainable development learning' at the community level, as well as empirical research while developing a sustainability curriculum at Upper Canada College, an independent boys school in Toronto, Canada. In light of the state of the biosphere, this paper proposes the following transformative tools: (1) environmental ethics; (2) early experiences in the natural world; (3) science as creation narrative; (4) the evolution-ecology-biodiversity-ecosystem services continuum; (5) environmental math and

ecological economics; (6) ecologically scientific literacy; (7) environmental history; and (8) sustainable development learning in action. Each can be integrated with the others and across the curriculum, at all levels.

Environmental ethics
No intellectual vice is more crippling than defiantly self-indulgent anthropocentrism. The principal task for humanity is to apply biological constraints on decision making, and apply cultural evolution to biological evolution to create a 'biology of ethics.' The result will be a more deeply understood and enduring code of moral values.
—E. O. Wilson

Global pollution and mass destruction of species are generally not recognised as evils by modern EuroAmerican-based cultures (Pergamon, 2002). The Death of Nature (Merchant, 1982) denotes the death of the European Earth ethic. The absence of an environmental ethic in the EuroAmerican conquest-of-Nature mindset has resulted in a civilisation that consumes the Earth and other species with little concern (Pergamon, 2002).

But believing that education can be values-free is naïve (Nash, 1991). Environmental education cannot be transformative without a solid ethical foundation. The Tbilisi Declaration states that "environmental education should ... encourage those ethical ... values which ... will further the development of conduct compatible with the preservation and improvement of the environment" (UNESCO, 1978).

Culturally imposed ethics can constrain human destructiveness. The Golden Rule would work if applied intergenerationally by conserving and replenishing Nature for future generations. Einstein's ethic was to expand the circle of compassion to all living things. Albert Schweitzer's 'fundamental principle of the moral' was that the good is to preserve life and the evil is to destroy life.

Environmental ethics is not new. Jainism, the ancient Indian religion, prohibits needless harm to all life (Chapple, 2001). "The individual life is good when it is in harmony with Nature", wrote Zeno of Citium in 300 BC. And African indigenous traditions, like those of North American first peoples, contain ethical messages that are passed from generation to generation to ensure respect for other living creatures (Kelbessa, 2005). Teachers can turn to many cultures and other eras in order to teach environmental ethics.

Nature-bonding experiences in the early years
We will not enter this kingdom of sustainability until we

allow our children the kind of childhood in which Biophilia can put down roots.
—David Orr

"The single greatest challenge currently facing our species is reconnecting people with Nature" (Sampson, 2005). Euro-American culture alienates people from natural environments by physically and psychologically separating them from Nature at the earliest age, in favour of immersion in an artificial/virtual/fantasy world. Yet, "direct, personal contact with other living things affects us in vital ways that vicarious experience can never replace" (Pyle, 2003, p. 209). "Extinction of experience" (ibid., p. 209) and "environmental generational amnesia" (Kahn, 2002) render people less likely to develop an ethic of Nature care.

Research now shows a wide range of beneficial effects of contact with the natural environment on physical health, emotional and spiritual wellbeing, and academic functioning (Foster & Linney, 2007). Undirected play in wild-like places results in environmental citizenship (Wells, 2000). An ethic of kindness to animals has life-long psychological benefits. Early Nature-connecting makes later environmental education more effective (Foster & Linney, 2007). This research will support environmental educators who understand the importance of taking students outside or bringing Nature indoors.

Children's innate biophilia—their natural love and affinity for other living beings (Wilson, 1984)—must be protected and nurtured. "[A] sense of wonder at the rich diversity and complexity of life is easily fostered in children. They spontaneously respond to nature" (AAAS, 1993). Teachers can model affection and respect for Nature in their language and attitude. Schools can express gratitude together before eating. Science education would be sure to include the dependence of all animals on green plants, that humans are animals, that other animals are social and skilled, and that animals have consciousness and feelings.

Indoors, teachers would make classrooms warm places with tenderness toward plants, kindness to animals, tolerance for spiders, and a Nature corner (Weston, 2005). Outdoors, teachers can help students develop a sense of place by allowing them to explore—literally—the earth beneath their feet. School grounds can be enhanced with naturalised areas. All students should plant seeds and tend plants. Natural history is learned in Nature. Letting children 'be' in Nature is vital for creating a generation of students who grow to care for, and care about, the natural world.

Life as great story
A coherent story of our origins—a powerful and true myth—can act as an effective intellectual vehicle ... in the building of a whole new legacy.
—Erik Chaisson (1997)

The dominant EuroAmerican narrative has told humans they are separate from Nature, that Nature is corrupt and something to be controlled, a belief compounded by the post-industrial mechanistic way of understanding life processes (Bowers, 1997; Merchant, 1982). This 'story' influences curriculum (and the hidden curriculum).

In contrast, the Great Story (Universe Story or Evolutionary Epic) is what Maria Montessori calls 'a spectacular vision of the universe'. The science of cosmogenesis and evolution connects humans to the universe, Earth and all life. The Great Story provides humanity a common creation story, a narrative that "embraces yet transcends all scientific, religious, and cultural stories" (Dowd, 2002). "For the first time in human existence we have a cosmic story that is not tied to one cultural tradition . . . but instead gathers every human group into its meanings" (Swimme, 1998).

The Great Story serves as a superior way for students to make sense of the world, and offers a powerful integrating theme in education. Montessori presented "the whole of the universe as a framework for all the children's later knowledge" (Lillard, 1996, p. 55), and based her education on five 'Great Lessons', starting with stories of the universe and the coming of life. Her method has been validated by research (Lillard, 2005). Theologic historian Thomas Berry (1988) taught the Universe Story as the context for all human understanding. "Both education and religion need to ground themselves within the story of the universe… Within this functional cosmology we can overcome our alienation and begin the renewal of life on a sustainable basis" (http://www.thegreatstory.org/).

The Evolution → Ecology → Biodiversity → Ecosystem Services Continuum
A major task for evolutionary biologists is to explain the origin of biodiversity.
—Peter R. Grant

Reductionism in education fragments the story of life, making it less intelligible while disconnecting students from Nature. Evolution reveals the unity in diversity of life. An understanding of the evolutionary process leads to comprehension of the principles of ecology and appreciation of how irreplaceably precious the diversity of life is to humanity, through ecosystem services or 'Nature's gifts'. This integrated continuum forms the basis for studying the life sciences and natural history—the stories of life.

Darwin explained that it is not the strongest nor the most intelligent of species that survive, but the species most responsive to change, so it is an ignorance of evolution that perpetuates the competitiveness ('survival of the fittest') ideology (Costall, 2004). Darwin's work and writings included the importance of mutualism and co-evolution, and inspired the new field of ecology (Haekel, 1866).

"United in a single theme, evolution and ecology provide a powerful lens through which to view life's web, forming the

foundation of an integrated and underutilised perspective on Nature"' (Sampson, 2005). According to biologists like Betsey Dyer, today's biodiversity is billions of years of evolutionary symbiosis (in Olson, 2005). Many people, however, lack knowledge about biodiversity, and fail to perceive a link between species preservation and humanity (Foster-Turley, 1996). Making these connections allows students to see the essential value of ecosystem services such as soil regeneration and water purification.

A further vital reason for teaching this integrated unit at all levels is to effectively address the sixth mass extinction event, for which modern culture is mainly responsible. "The science of biodiversity has become the science of our future" (Levin, 2004).

"As educators, we must demonstrate that the marvelous, interwoven complexity that characterises every ecosystem, ancient and modern, is the result of a co-evolutionary dance that has required millions upon millions of years" (Sampson, 2005).

Environmental mathematics
Economic thinking ... is peculiarly unable to consider the long term and to appreciate man's dependence on the natural world.
—E. F. Schumacher

To most educators, environmental math may sound strange, but the two go together well. Scientific literacy requires skill in math, as does learning about ecology and environmental systems. There is plenty of math to be discovered in the natural world, from patterns in Nature to Nature's engineering, and a symbiosis exists between basic scientific principles and their mathematical expressions in Nature (Adam, 2003). Excluding Nature from the math classroom is unnatural. Including Nature would enliven the subject. The Mathematical Association of America has a Mathematics and the Environment website to guide this integration.

Young students can be taught sustainability using simple math, such as sharing. Basic mathematics—percents, ratios, graphs and charts, sequences, sampling, averages, growth, calculus, variability and probability—all relate to current, critical issues such as pollution and the sustainable availability of resources. Understanding the math of exponential growth and limits to growth is essential for environmmental literacy. Mathematical modelling is essential in assessing global environmental change. Online curricula teach math through current global issues, including population growth, biodiversity, climate change, natural resource use, and ecological footprinting (see, for example, the Qualitative Environmental Learning Project)

The absence of Nature in math is extended to the math of economic accounting. To most economists, Nature does not count because it is an externality, and GDPs are calculated by counting environmental losses as

economic benefits. This is despite new environmental acounting methodologies and the application of ethics in modern academic economics (Stern, 2006; Stiglitz, 2002). Exponential, limitless economic growth continues, so environmental depletion, degradation, and pollution have now exceeded the planet's carrying capacity (World Wildlife Fund, 2006). Global warming is the worst market failure ever (Stern, 2006). Conventional economics is terrible math, devastating for Nature, and fatal for the future. The solution is to teach the mathematics of sustainable development by insisting on integrating social and environmental costs in the teaching of economics.

Ecologically inclusive scientific literacy
Scientific literacy may likely determine whether or not democratic society will survive into the 21st century.
—L. M. Lederman

Scientific literacy rates in industrialised countries are shockingly low (Miller, 2007). In many jurisdictions, definitions of scientfic literacy exclude reference to the natural environment (Aikenhead, 2002). The policy of Canada's education ministers serves as an example to follow, as it includes environmental literacy. "Students will develop an understanding of the nature [Nature?] of science and technology, of the relationships between science and technology, and of the social and environmental contexts of science and technology" (CMEC, 1995).

Carl Sagan (Sagan & Druyan, 1997, p. 6-7) warned that the consequences of scientific illiteracy have become extremely dangerous. "It's perilous and foolhardy for the average citizen to remain ignorant about global warming, say, or ozone depletion, air pollution, toxic and radioactive wastes, acid rain, topsoil erosion, tropical deforestation, exponential population growth".

And yet, these consequences continue every day, around the world. "Most of us no longer have any idea of what is scientifically plausible and what is scientific nonsense. In this hyper-technological age, where so many things, perhaps even our survival, depend upon subtle decisions by a scientifically informed citizenry, that ignorance is deeply alarming" (Homer-Dixon, 2001).

Educators need to include ecological literacy in teaching for scientific literacy (Margadant-van Arcken, 2002). Students cannot be expected to judge what they do not fully understand. They need to be taught causality; weight of evidence; peer review; feedback loops; shifting baselines; different timescales; exponential growth; the precautionary principle; ecological limits to science; some knowledge of the world around them, locally (natural history) and globally (state of the planet); principles of sustainable development; and especially the science of global warming, because sustainability depends on their eco-inclusive scientific literacy.

Environmental history
The historians, even when articulating world history, deal

not with the whole world but just with the human, as if the human were something separate from or an addendum to the story of the Earth and the universe.
—Brian Swimme and Thomas Berry

One of the most striking indications of the modern cultural disconnect from Nature is the exclusion of the natural environment from history teaching. To remedy this disconnect, all history would include, indeed focus on, environmental history.

History teaching has traditionally portrayed the history of the Earth in terms of wars, great civilisations, and human achievements, ignoring environmental contexts that triggered—or were caused by—these events (Leemans & Costanza, 2005). In contrast, environmental history "draws on social, political, economic, and intellectual history, the history of science, and the roots of environmental values" (Merchant, 2006). It could also include examples of more sustainable cultures.

The goal of environmental history is to understand how humans have affected and been affected by their natural environment, and with what results. Understanding past environmental change is a prerequisite for understanding future change (Leemans & Costanza, 2005). Students need to learn the history of the state of the planet (shifting baselines) to be able to work on sustainability solutions. As one important example, older students need to learn the history of the current, human-driven, mass extinction of species (Eldredge, 2001). Environmental history timelines are available from the Worldwatch Institute.

History is often taught as values-free, so the record of Euro-American destructive wars and oppressive exploitation escapes moral censure, allowing terrible socio-environmental mistakes to be repeated. In contrast, environmental history places the past in an ethical framework. For example, because of Africa's colonial history of subjugation, African environmental history has made its contribution by refiguring colonialism in environmental terms, placing an emphasis on the history of environmental injustice and eco-racism (Carruthers, 2005).

Students conclude what matters to their culture—and what does not—by what is left in or out of 'his story' (Orr, 1992, p. 85). History does not teach for a sustainable future. Socio-environmental history—'our story'—does.

Sustainable Development Learning In Action
The great aim of education is not knowledge, but action.
—Herbert Spencer

Sustainable development, as formulated at the United Nations Rio Earth Summit in 1992, is ethics in action, resulting in intra- and intergenerational equity as the way

to peace and sustainability. It is a new expression of an age-old concept, one practised in traditional cultures (Orr, 1992). An example is the Haudenosaunee Great Law of Peace, an ethic mandating the welfare and wellbeing of the seventh generation to come (accessed 30/3/2007 at http://www.ratical.org/many_worlds/6Nations/#ISCD).

Agenda 21 is the UN's comprehensive and detailed 'action plan' for sustainable development (including, as important examples, peace making, internalisation of social and environmental costs, and the precautionary and polluter pays principles), capable of transforming the economics barrier to sustainability.

According to Koïchiro Matsuura, UNESCO Director General, 'The principles of sustainable development must find themselves in children's schooling. This means that education will have to change so that it addresses the social, economic, cultural and environmental problems that we face in the 21st century'. Linking sustainability with teaching about the state of the planet offers a powerful integrating theme throughout education. Local sustainable development action by students is transformative for them (Leigh, 2005). Young students can grasp the sustainable development concept when presented as an ethic of fairness (Johnston, 2007). For older students, it can be taught in science, civics and geography courses by integrating the economic, social equity, and environmental aspects of every topic in each course (the key principle of sustainable development). Graduating students should be competent in sustainability before entering the workforce.

For educational purposes, see (accessed 30/3/2007):
•A condensed Agenda 21 (http://www.iisd.org/rio+5/agenda/riodocs.htm)
•Canadian Youth Action Guide for Agenda 21 (http://www.lsf-lst.ca/en/teachers/agenda21.php)
•Rescue Mission: Planet Earth (http://www.unicef.org/publications/index_6446.html)
•International Institute for Sustainable Development Timeline (http://www.iisd.org/rio+5/timeline/sdtimeline.htm)
•Interactive Learning About Sustainable Development (http://www.iisd.org/educate/learn.htm)

Learning about sustainable development—its history and 'story', its principles and processes, and its promise—can lead to action for sustainability (Johnston, 2003). The Earth Charter (http://www.earthcharter.org/) calls for education to 'provide all, especially children and youth, with educational opportunities that empower them to contribute actively to sustainable development'. Environmental educators can teach about sustainable development in compelling, experiential ways that lead to, well, sustainable development. The future depends on this.

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The Influence of Wilderness Experience on the adoption of Environmentally Responsible Behaviour

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Abstract
Conventional environmental education programmes appear to have limitations in precipitating the radical change needed to solve major environmental problems. This presentation discusses the potential of wilderness experience (WE) as a catalyst for developing eco-literacy and environmentally responsible behaviour (ERB). Attitudinal changes and adoption of ERB by adult participants, following a weekend WE, were probed through group and individual interviews. Results indicate that WE may be a significant catalyst in developing eco-literacy, while effects on adoption of ERB are diluted by several factors. The research highlights opportunities for the use of WE in education programmes.

Introduction

Reliable and durable interventions for the development of eco-literacy and the entrenchment of environmentally responsible behaviour (ERB), have become a matter of urgency if humans are to prevent irreparable damage to the earth's life support systems. Interventions founded on developing an understanding of the place of humans in nature, as one animal in the ecosystem, are urgently needed. Only once this happens can durable changes to specific ERB be expected.

The challenge is to develop interventions that address this issue of reconnection with nature in the human mind. Although widely used for personal growth purposes, wilderness experience (WE) has not commonly been used specifically for the development of eco-literacy and ultimately ERB. In this paper, the effectiveness of a weekend WE on the development of eco-literacy, incorporating a reconnection to nature, and consequent adoption of ERB, is discussed. Three groups of volunteer participants were interviewed before and after a weekend WE in the Pilanesberg National Park, located in the North West Province of South Africa.

Theoretical Framework

David Orr (2004) makes an urgent case for an overhaul of formal education, which currently prepares people for careers supporting economic development, rather than imparting an understanding of our place in nature and dependency on natural life support systems. A new approach should create and promote biophilia[1], acknowledging the importance of emotion and strong feelings of affinity for life, in finding solutions to our problems.

Guided WEs are designed to facilitate learning about and understanding our place in nature through immersion in a pristine natural setting. These experiences can take different forms. Sibthorpe et al. (2003) argue that without intentional design of WE for purposes of, *inter alia*, particular types of education, participants may benefit spiritually, emotionally and physiologically, but may not gain new knowledge, understanding or skills. Andrews (1999:35) describes the "wilderness expedition (as) one of the most intensive forms of experiential education", during which participants are facilitated in connecting with nature and exposed to a worldview enabling them to consider alternative lifestyles.

The Wilderness Leadership School (WLS) in South Africa runs wilderness trails that are open to anyone who is interested. The purpose of these trails is to "walk in search of a deeper spiritual understanding of nature and of our place in the universe" (Wilderness Leadership Foundation, 2005).

Kellert and Durr (1998) conducted a study to identify the impact of WE in the United States. They group various physical, emotional, intellectual, environmental and moral-spiritual impacts into effects on participants' environmental interest, knowledge, attitude and behaviour, and personal and character development. There is, however, little in the literature about the effects of WE on influencing ERB.

McCallum (2005b), Cullinan (2002), Capra (2003) and others define eco-literacy, in terms of knowing and accepting the inherent connection of humans to nature. Eco-literacy comprises an understanding of the system within which we live and our impact on that system. Orr (2004:32) suggests that developing eco-literacy is the only way we can deal with the "ecological emergency" we have created. Elsewhere, Orr (1992:92-93) defines eco-literacy as incorporating components of comprehension of interrelatedness, an attitude of care and stewardship, an ability to act on the basis of knowledge and feeling, understanding how people relate to each other and to nature, knowledge of how the physical world works, where we fit in the story of evolution, a knowledge of the nature, extent and speed of our ecological crisis and a knowledge of the dynamics of our modern world and how we think about it. Human connectedness to nature is implicit in this definition.

Monroe (2003:114) defines ERB as "those activities that support a sustainable society". These activities can be direct or indirect. Direct action that can be taken at the household level includes, for example, taking fewer trips by car, and installing compact fluorescent light

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[1] The term biophilia is attributed to E.O. Wilson and is the subject of his book co-authored with Kellert, entitled The Biophilia Hypothesis.

bulbs and water saving devices (Monroe, 2003). Stern (2000) identifies other forms such as environmental activism, and influencing public policy formulation and organisational behaviour. He asserts that ERB should both prevent impact and enhance benefits. The cultivation of ERB is complicated by various barriers to its development, e.g. technology, attitudes or values, knowledge and material resources. Stern describes ERB as "dauntingly complex" (Stern, 2000, p. 421).

Mechanisms for developing ERB include formal and informal methods, both within the classroom and outdoors. Zelezny (1999:1) has found that a positive relationship between education and behavioural change, is dependent on several variables, *viz*. the location of the educational experience, the nature of participation and the length and nature of the intervention.

Most environmental education activities are directed at children and youth. Adult environmental education programmes must be designed differently to facilitate learning to "think, act and work creatively and collectively…for a more sustainable place in which to live and work" (Clover, 2002, p. 183). Monroe (2003) emphasises the importance of eco-literacy as a prerequisite for ERB, and suggests that adult programmes should thus focus on cultivating eco-literacy to provide a basis for behavioural change.

Research design and Methodology

Design and Methodology
The research was conducted in four phases:
- *Preparation,* involving consultation with wilderness guides and participation by the researcher in a weekend WE in the Pilanesberg National Park, and the design of the field instruments.
- *Pilot testing of* preliminary field instruments with a pilot group and refining for field use.
- *Field work* comprising focus group discussions and interviews of three groups of trailists immediately before a weekend trail and immediately on exiting the trail, and via individual interviews 3-4 months after the trail.
- *Analysis and synthesis of findings* from interview transcripts to identify common themes, changes in ecoliteracy and adoption of ERB by individual participants.

The research was conducted as a qualitative case study incorporating field research. It was intended to construct a thick description of individual development of eco-literacy and subsequent change in ERB, based on a WE and measured before, immediately after, and 3-4 months after the completion of the experience. The intention was to observe a process of change of behaviour of the participants over a period of time. The analysis included consideration of the motivation for, and barriers to, the development of eco-literacy and subsequent change in ERB, and influences of participants' perspectives and

behaviours, as suggested by Babbie and Mouton (2001).

The Wilderness Leadership School (WLS) of South Africa runs an adult wilderness programme in the Pilanesberg National Park, north west of Johannesburg, South Africa. Participants in this programme were selected for voluntary participation in the research. Three sample groups were selected at random from the annual trail schedule. Four members of each of the selected sample groups of 7-8 trail participants (50% of each trail group), were then randomly selected and invited to participate voluntarily in the research project.

The weekend WE comprises the following:
- An introduction by the wilderness guides to general conduct and safety in wilderness.
- Walking in the wilderness area of the reserve, conducted in silence.
- Regular stops along walks for nature interpretation and knowledge sharing by the wilderness guides.
- Stops along walks for rest and periods of solitude and meditation in wilderness. Participants spend up to an hour at a time in solitude. Meditations are guided by the wilderness guide(s), and aimed at developing a sense of connection with nature.
- Solo night watch by each participant for an hour each night, for safekeeping of the group and additional time in solitude.
- A trail close-out discussion prior to exiting the WE to discuss learning, experiences and insights gained.

Research Techniques
Facilitated focus group discussions (FGD) and semi-structured interviews (SSI) were used for the field research. Participation of the researcher in the weekend WE enabled pilot testing of the field instruments and further informed their design. Personal perspectives gained in the WE, and those of the wilderness guides and fellow participants were incorporated into the design of the instruments.

One FGD was held with each participant group immediately prior to their wilderness trail to gauge attitudes, opinions, motivations and current states of eco-literacy and ERB. A second FGD was held at exit of each group from the WE, while still in the reserve, to record key elements of the experience and changes to attitudes, opinions, motivations and current thought on eco-literacy and ERB. Each individual participant was interviewed again 3-4 months after their WE, to track changes in eco-literacy development and find evidence for newly adopted ERB.

Data analysis
Transcripts of the FGDs and individual interviews were analysed using grounded theory (Glaser & Strauss, 1967). Issues and trends were identified in each of the interview transcripts, relating both to the content and the story of the individual participant. Using a process of constant comparison, several themes and sub-themes were extracted from the interview data and interpreted. The individual interviews were primarily used to determine

individual changes in eco-literacy and adoption of new ERB as a result of the WE. These changes were analysed using the framework provided by the themes evident in the FGDs.

Findings

Themes emerging from the data

Several themes emerged from the three phases of interviews with participants. Commonalities or synergies were combined into complexes of themes to reveal core issues. The themes are outlined in *Figure 1*.

Complexes A and B show two separate and apparently mutually exclusive concepts of nature evident in the responses of the participants. These concepts are fundamental to the level of eco-literacy in individual participants and the manner in which they underpin the adoption or rejection of ERB become evident in complexes C and D. Substantive evidence exists in the responses of all participants of an inherently perceived connection to nature. In some the connection is unconscious and unacknowledged. In others it is conscious and known. The boundary between the two concepts is thus porous and attests to confusion in the human mind, created by an artificial separation from nature imposed by culture and social evolution.
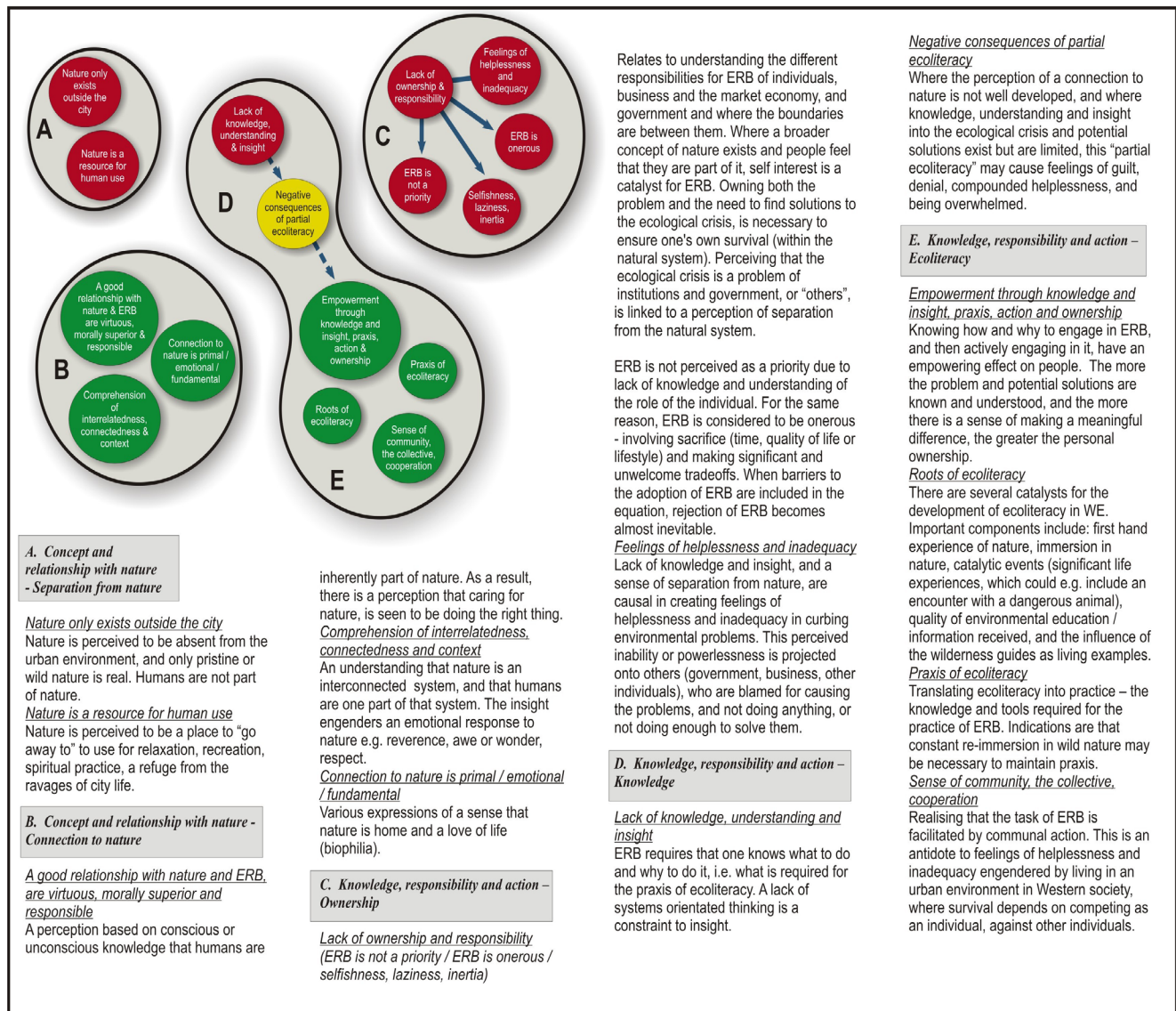

A. Concept and relationship with nature - Separation from nature

Nature only exists outside the city
Nature is perceived to be absent from the urban environment, and only pristine or wild nature is real. Humans are not part of nature.
Nature is a resource for human use
Nature is perceived to be a place to "go away to" to use for relaxation, recreation, spiritual practice, a refuge from the ravages of city life.

B. Concept and relationship with nature - Connection to nature

A good relationship with nature and ERB, are virtuous, morally superior and responsible
A perception based on conscious or unconscious knowledge that humans are inherently part of nature. As a result, there is a perception that caring for nature, is seen to be doing the right thing.
Comprehension of interrelatedness, connectedness and context
An understanding that nature is an interconnected system, and that humans are one part of that system. The insight engenders an emotional response to nature e.g. reverence, awe or wonder, respect.
Connection to nature is primal / emotional / fundamental
Various expressions of a sense that nature is home and a love of life (biophilia).

C. Knowledge, responsibility and action – Ownership

Lack of ownership and responsibility (ERB is not a priority / ERB is onerous / selfishness, laziness, inertia)
Relates to understanding the different responsibilities for ERB of individuals, business and the market economy, and government and where the boundaries are between them. Where a broader concept of nature exists and people feel that they are part of it, self interest is a catalyst for ERB. Owning both the problem and the need to find solutions to the ecological crisis, is necessary to ensure one's own survival (within the natural system). Perceiving that the ecological crisis is a problem of institutions and government, or "others", is linked to a perception of separation from the natural system.

ERB is not perceived as a priority due to lack of knowledge and understanding of the role of the individual. For the same reason, ERB is considered to be onerous - involving sacrifice (time, quality of life or lifestyle) and making significant and unwelcome tradeoffs. When barriers to the adoption of ERB are included in the equation, rejection of ERB becomes almost inevitable.
Feelings of helplessness and inadequacy
Lack of knowledge and insight, and a sense of separation from nature, are causal in creating feelings of helplessness and inadequacy in curbing environmental problems. This perceived inability or powerlessness is projected onto others (government, business, other individuals), who are blamed for causing the problems, and not doing anything, or not doing enough to solve them.

D. Knowledge, responsibility and action – Knowledge

Lack of knowledge, understanding and insight
ERB requires that one knows what to do and why to do it, i.e. what is required for the praxis of ecoliteracy. A lack of systems orientated thinking is a constraint to insight.

Negative consequences of partial ecoliteracy
Where the perception of a connection to nature is not well developed, and where knowledge, understanding and insight into the ecological crisis and potential solutions exist but are limited, this "partial ecoliteracy" may cause feelings of guilt, denial, compounded helplessness, and being overwhelmed.

E. Knowledge, responsibility and action – Ecoliteracy

Empowerment through knowledge and insight, praxis, action and ownership
Knowing how and why to engage in ERB, and then actively engaging in it, have an empowering effect on people. The more the problem and potential solutions are known and understood, and the more there is a sense of making a meaningful difference, the greater the personal ownership.
Roots of ecoliteracy
There are several catalysts for the development of ecoliteracy in WE. Important components include: first hand experience of nature, immersion in nature, catalytic events (significant life experiences, which could e.g. include an encounter with a dangerous animal), quality of environmental education / information received, and the influence of the wilderness guides as living examples.
Praxis of ecoliteracy
Translating ecoliteracy into practice – the knowledge and tools required for the practice of ERB. Indications are that constant re-immersion in wild nature may be necessary to maintain praxis.
Sense of community, the collective, cooperation
Realising that the task of ERB is facilitated by communal action. This is an antidote to feelings of helplessness and inadequacy engendered by living in an urban environment in Western society, where survival depends on competing as an individual, against other individuals.

Figure 1: **Complexity emerging from the data**

The themes in complexes D and E are arranged to show a progression from a position of ignorance and helplessness, through a process of empowerment via growing eco-literacy and competence in ERB.

Development of eco-literacy and adoption of ERB
Discussions in the FGDs and the individual follow up interviews were structured around two groups of issues:-

- those intended to reveal the concept of and relationship with nature, of each of the participants (eco-literacy); and
- those intended to reveal the nature and extent of individual ERB.

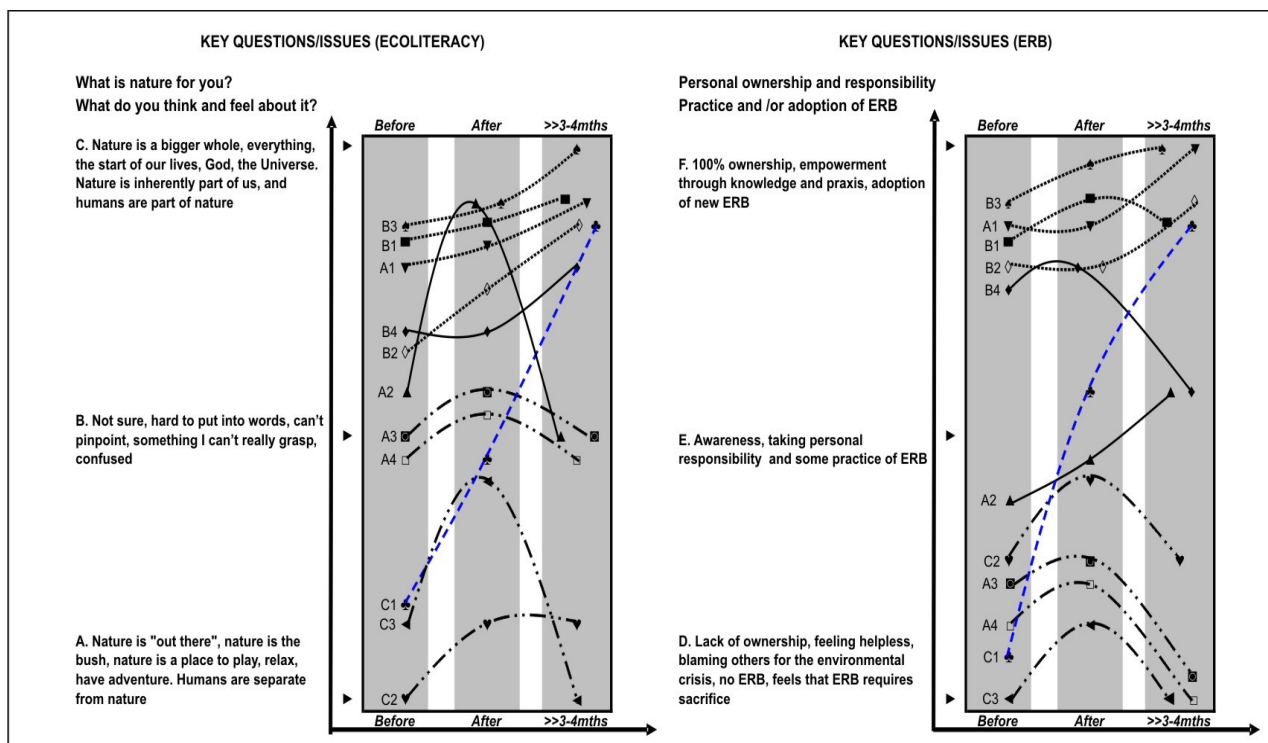Changes in individual eco-literacy and ERB are illustrated in Figure 2.

Figure 2: Individual changes in eco-literacy and ERB

In the graph on the left, responses to the questions "What is nature for you?" and "What do you think about it?" are illustrated along an axis from A to C, where A represents a constricted concept of nature, which also excludes humans, and C a concept of nature that acknowledges a system within which every living and non-living thing on earth and in the Universe is connected, including humans. The perspective of each participant before entry, at exiting (after), and 3-4 months after completion of the WE, is shown in the graph. The graph on the right shows responses to questions probing the level of personal ownership and responsibility for environmental problems and solutions evident in each participant and corresponding ERB.

Participants with high eco-literacy at entry (B1, B3, A1, B2), with an all encompassing, complex concept of nature which includes humans, have a correspondingly high ERB index throughout the study period, i.e. high eco-literacy at entry translates into a consistently high level of ERB throughout, or there may also be slight improvement in eco-literacy and ERB. Many of these participants already had entrenched ERB at entry e.g. household recycling.

One participant with low eco-literacy at entry, but whose eco-literacy improved significantly (C1), also adopted ERB i.e. low entry level eco-literacy developing into significantly higher eco-literacy 3-4 months after the WE, translated into significant new ERB. This substantive improvement in eco-literacy may relate to a "first exposure" to wild nature.

Participants with low entry level eco-literacy that remained constant throughout the study period (A3, A4, C2, C3), did not adopt any significant ERB. These participants

all felt separate from and had a constrained concept of nature, viz. nature is "out there", out of the city and mostly confined to "the bush" or pristine nature.

Two participants exhibited a moderate level of eco-literacy at entry (A2, B4). One showed a substantive improvement in eco-literacy, as a result of feelings of connection to nature, interrelatedness and context immediately after the trail, but this diminished over time, and translated into a positive but insignificant change in ERB. Eco-literacy in the second participant improved after the WE, based on an ability to apply insights gained to day to day life. This partial improvement in eco-literacy (awareness, knowledge and insight) led to feelings of greater helplessness and inadequacy in solving environmental problems.

Participants reported a range of changes in elements of eco-literacy, ERB and personal growth that they attributed to the WE. These included:

- Significantly *improved awareness* of nature, and the impacts on the ecosystem of every task in daily life.
- A new *love for nature.*
- Feeling *empowered by information* from the guides (new knowledge).
- *Greater appreciation* for amenities in the city or for "what I have in my life".
- *Overcoming personal challenges* e.g. fear of failure.
- *Adoption of new ERB* e.g. no longer throwing litter out of the car window, picking up litter, using compact fluorescent light bulbs, recycling additional materials.

The participants identified several barriers to adoption of ERB. All participants identified at least one barrier, but varied in their perceived ability and willingness to

overcome the barriers. Barriers identified included:

- What I do (as one person) won't make a difference.
- Environmentally friendly consumer products are hard to find e.g. organic food, household cleaners.
- Adopting ERB ("committing my life to conservation") requires that I change my lifestyle or give up my job.
- Laziness and inertia (I know I should be doing something but I don't get around to it).
- Institutional failures e.g. not providing waste removal facilities that encourage household recycling.
- Dependency on personal transport (lack of functional and reliable public transport).
- Lack of knowledge (know how) about ERB.
- No exposure to an alternative to consumerism.
- Failure to enforce environmental laws.
- No incentives for ERB e.g. financial reward for whistle blowers.
- Government focus on economic growth.
- No time available for ERB.

Discussion

The findings suggest a positive feedback in the process of growing eco-literacy. The more eco-literacy improves, the more awareness grows, the more the person seeks out information and understands, and the greater the compulsion to adopt ERB. A constrained concept of nature appears to stall initiation of the process of developing eco-literacy. However, the WE seems to broaden people's concept of nature. In some cases, this stimulates adoption of ERB. In general, a strong awareness of a connection to nature experienced by all participants and expressed immediately after the WE, tended to dissipate with time. It appears that constant reminders or repeat visits to "nature out there" are needed to rekindle the awareness.

Participants who appear to see connections between different environmental problems (e.g. industry – pollution – climate change) are more likely to adopt ERB than those who see single problems in isolation, e.g. littering.

Personal background and exposure to nature, particularly wild nature, seemed to have some bearing on participants' responses to the WE. One participant in particular, showed substantive growth in eco-literacy and adoption of significant ERB after the WE. This could be a consequence of no prior exposure to wild nature, coupled with a worldview created in an impoverished childhood. All participants highlighted the intent, quality and intensity of facilitation by the wilderness guides. The limitations imposed by the short time period of the weekend WE are significantly mitigated by the conduct of the wilderness guide. Many participants referred to the profound effect on themselves and their learning on the trail, of the living example posed by the guides. Participants also indicated that they learned from each other and that they quickly felt like they had known each other for a long time, despite in most cases being strangers prior to the WE. Some participants referred to an unspoken bonding that occurred, facilitated by merely being in wilderness.

The format and process of the WE, as facilitated by the wilderness guides, are designed to encourage development of eco-literacy. They comprise the contributions of the guides, immersion in wild nature during the day and at night, and interaction within the group. Participants referred to profound experiences and learning, in relation to all three components.

Conclusion

There is clear evidence that even a short, facilitated WE can have a catalytic effect on development of eco-literacy in individual adults. In a few cases, an increment in eco-literacy is translated into ERB but this is often dependent on a pre-existing and fairly high level of eco-literacy, or on factors like the background and history of the individual.

Growth in eco-literacy as a result of the WE appears to be determined by people's relationship with and concept of nature. Where the concept is system orientated and incorporates humans, growth in eco-literacy can be significant. A constrained concept of nature limits capacity for growth in eco-literacy. Since ERB depends on a fair level of eco-literacy, it is unsurprising that individuals with the latter perspective showed little or no adoption of ERB as result of the WE.

Many participants experienced a rapid waning of awareness of a connection to nature after the WE. A weekend may therefore be too short to provide sufficient experience and learning to counter a general sense of disconnectedness. It may also suggest that orientation prior to entry and a follow up activity could be beneficial in deepening learning and experience of the WE.

Finally, there are many barriers to adopting ERB in an urban environment in South Africa. However, even small shifts in awareness towards developing eco-literacy can begin a process of challenging and overcoming many barriers. Once the first step is taken towards ERB, adopting additional tasks becomes easier.

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Youth, Ecological Literacy, and Environmental Art in the Bahamas

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Abstract

The youth attending The Cape Eleuthera Island School in the Bahamas have an unusual opportunity to freely express their understanding of ecological knowledge. This research explores how artistic expression within the matrix of environmental education can influence ecological literacy in youth. I examine students at the place-based The Cape Eleuthera Island School as a case study for their expression and understanding of ecological literacy. This research provides insight into the relationships among art, environmental education and ecological literacy and will contribute to understanding of creative expression as an important component of environmental education.

Introduction

Environmental Art and artistic expression of ecological literacy are innate activities of human interaction within ecological communities (Anati, 1999; Rosenthal, 2003). Through the expression of ecological literacy, humans deepen their understanding of the natural systems that surround them. Rosenthal uses the term 'Eco-Art' to describe this discipline: "Eco-art offers a vehicle to cultivate systems thinking, interdisciplinary problem solving, collaboration, and social and environmental responsibility" (2003, p. 154). To this end, eco-art within an environmental education matrix enhances an individual's sense of place, creativity, and his/her role within the community (Kellman, 1998).

Ecological literacy within environmental education is the narrative in which we embed our sets of beliefs, values, and knowledge of the environment (Cutter-MacKenzie & Smith, 2003; Fisher, 2005; Prakash, 1995). "All forms of communication essential to sustaining cultural patterns are part of the process of environmental education" (Bowers, 1996). Thus, the rich narrative and communicative quality of environmental education resides within the creative reflection of bio-complexity and provides a robust pedagogical platform on which to build an environmental art curriculum (Savva, Trimis, & Zachariou, 2004). However, the current lack of formal and non-formal environmental education within the western education system is limiting development towards an eco-literate society (Cutter-MacKenzie & Smith, 2003; Fisher, 2005). Indeed, Orr (1990) believes the deficiency of environmental integration is the root cause of our current ecological crises.

Despite the scarcity of environmental education in the formal education system in the western world, one institution has been exemplary in its formation and leadership of ecological literacy curriculum for youth.

The Cape Eleuthera Island School in The Bahamas is an experiential place-based school that enrolls North American and Bahamian students for one three-month semester. This school meets the curricular outcomes of a typical North American high-school as well as provides outdoor and trans-disciplinary opportunities in research, mathematics, humanities, science and arts. As a result of attending The Island School, the students are well exposed to a diversity of worldviews that are both scientific and culturally relevant (Maxey, personal communication, 16/2/07). This school facilitates experiences that encourage place-based social responsibility in a transformational setting. In particular, the environmental art program within The Island School framework acts as an integrating course allowing for reflection and expression of understanding about the other curricula.

This research aims to discover the effects of environmental education on a youth's expression of ecological literacy through environmental art. Data collection was framed as a case study that examines grade ten and eleven participants' artistic experiences through the creation of 'trees of ecological literacy' (Thomashow, 1995; Wilson, 1995) during one semester of school.

My research focused on the following questions: How does place-based environmental education affect a youth's expression and level of ecological literacy? What is the connection between environmental art, place-based learning and ecological literacy?

Ecological Literacy Defined

For the purposes of this study, I use Orr's (1992, p. 92) definition of ecological literacy. Ecological literacy is "how people and societies relate to each other and to natural systems, and how they might do so sustainably". Further to this, an ecologically literate person understands ecological systems, and how people and communities impact the systems in which they live (Cutter-MacKenzie & Smith, 2003).

Still more difficult than defining ecological literacy, is the description of a person's level of ecological literacy. Cutter-MacKenzie and Smith present a matrix of ecological literacy levels, based on Roth's work, which gives indicators that allow evaluators to gauge the complex array of ecological understanding (Appendix A). The ecological literacy matrix enriches the descriptive component of this project, as it can be easily adapted into an evaluation rubric for the assignments associated with the art course curriculum. One challenge with this matrix is that it acts as a grayscale with limited ability to catalogue a person with multiple

belief systems that might seemingly conflict. However, for the purposes of the expression of ecological literacy through environmental art, this matrix is an effective tool.

Youth and the Expression of Ecological Knowledge
Environmental art provides a direct way to express one's understanding of the environment and includes creative expression in and about the environment utilising both old and new media (Savva, Trimis, & Zachariou, 2004). However, youth are under-exposed to the concepts and inspiration that environmental art encourages (Rosenthal, 2003). Within the twenty-first century, expression of understanding and creative art is a dynamic and complex exchange through an increasingly mediated system of international peers and mentors (Thompson, 1997; UNDESA, 2005). With increased exposure to digital technologies, there is concern that the expression of ecological literacy is being over-run by this fascination with technology. New forms of media literacy are needed to help guide youth in their communicative experiences about ecological knowledge (Carrington & Marsh, 2005).

Encapsulated within the complexity of new-media creativity and its potential effects on creative expression lies the combination of young people and art that supports individual and community growth (Boldt & Brooks, 2006). Environmental art can be a creative way to express an understanding of ecological systems and provide "real world" experiences that endorse a young person's sense of being and authenticity. Available time and space for environmental creativity can convert a curriculum of "thinking" to a curriculum of "doing" (Loock, Myburqh, & Poggenpoel, 2003). In turn, youth can be transformed through participating in an active curriculum where they gain understanding in creative expression and increase their ecological literacy. Place-based learning scenarios, or schools that utilise the local ecological and social communities for curricula, such as The Cape Eleuthera Island School, are particularly useful in fostering creativity and ecological literacy (Kellman, 1998; Knapp, 2006; Sobel, 1998).

Place-Based Learning: A Case Study at the Island School
The Cape Eleuthera Island School is located on the southwest end of Eleuthera Island in The Bahamas Archipelago (24°50'06" N; 76°19'32"). Its curriculum is infused with place-based education as described within its vision (http://www.islandschool.org/about_us_vision.html, March 28, 2007):

- Connecting students to place through continuous interaction with local culture and environments;
- Developing citizens who maintain responsibility for themselves, larger communities and the biosphere;
- Creating authentic learning opportunities where students are producers of information that has lasting value beyond the classroom experience;
- Building an understanding of personal and cultural lens and bias and the roles they play in reaching solutions to problems;
- Empowering students to continue to be active as leaders and educators in their communities after

graduation; and
- Modeling sustainable systems that allow us to live with a reverence for the future.

The Cape Eleuthera Island School represents a model for sustainable environmental education and is built to promote the development of responsible, caring global citizens by restoring a sense of wonder and respect for biotic and cultural complexity (Danlychuck, Bachland & Maxey, 2004). This school's innovative location fosters an exploratory element to the place-based curriculum and engenders a sense of place by embedding its curriculum in the local environment and culture. Many of the students who have attended The Island School have described their experience as being transformational and life-changing (Maxey, personal communication, 2/12/06).

Methods
An ethnographic case study approach was used to describe the impact of environmental education on ecological literacy expression and understanding in 16 youth attending The Cape Eleuthera Island School during the Spring 2007 semester.

The research is based around an art assignment called "Tree of Ecological Literacy". This assignment was an adaptation on Thomashow's 'tree of environmentalism' that uses a tree image as a metaphor of personal ecological literacy growth (Thomashow, 1995). The tree was constructed as a personal identity project where the physical elements of the tree represented concepts of the past, present and future elements of emotional and physical self with particular reverence towards ecological connectedness. The roots of the tree represent past personal foundations of the student's ecological literacy. The trunk represents the participants' home and environmental issues that exist there. The branches represent future goals, what their hopes are in learning about the environment, and what they want to learn and experience in relation to ecological literacy at The Cape Eleuthera Island School.

The 16 participants and their trees were evaluated using a constructivist (ie. Fourth Generation) methodology (Guba & Lincoln, 2001). This evaluation is grounded in an ethnographic process that allows for a deeper understanding of relative change within a small group. Using Fourth Generation methodology in learning environments such as The Cape Eleuthera Island School is particularly useful because it supports a contextual relativist approach to understanding. The participants within this approach assume a stakeholder status and inform the outcome of the research through a collaborative process. Embedded within the Fourth Generation methodology, I use an ethnographic observation and thematic analysis of dialectic interviews (Fereday & Muir-Cochrane, 2006). The data was coded using the Cutter-Mackenzie and Smith ecological literacy matrix (Table 1).

Table 1. Ecological literacy levels (adapted from (Cutter-MacKenzie & Smith, 2003)

Ecological Literacy	Eco-Philosophy
Ecological Illiteracy	Technocratic (Anthropocentric) Perspective Believes that environment is a resource to be used by human beings All economic growth is good Many misconceptions about environmental issues
Nominal Ecological Literacy	Accommodation Perspective Reformist belief that economic growth and resource exploitation can continue May possess misconceptions about and provide naïve explanations of environmental system
Functional/Operational Ecological Literacy	Communalist (Eco-Socialist) Perspective Is personally committed to environmental quality Personally committed to environmental education and the production of environmentally literate and committed citizenry. Understands the organisation and functioning of environmental systems and their interaction
Highly Evolved Ecological Literacy	Gaia Ecocentric Perspective Faith in cooperative capabilities of societies to establish self-reliant communities based on sustainable resource use. Belief that humanity should live simply, so that other non-human communities can live. Possesses a thorough understanding of the dynamics of the environmental crises, which includes a thorough understanding of how people (and societies) have become so destructive

Despite the singular nature of this case study design, as opposed to a multiple case study comparison, this methodology holds the four principles of design quality (Yin, 2003): a) construct validity through the comparative phases, b) internal validity through triangulation of data collection, c) external validity through the sample size, literature review, and diversity of the student's backgrounds, and d) reliability through the length of process (3 months) and collaborative nature of The Cape Eleuthera Island School's curriculum.

Results and Discussion
Place-based learning atmospheres such as The Island School are greatly enhanced by diversity within the student population. The pre-existing understandings, or schema, of students provides for a dynamic peer-learning environment. The participants' schema affects their expression of ecological literacy. The disparity among the participants' pre-existing knowledge is most conspicuous when evaluating the pre-semester assignment: Trees of Ecological Literacy. On the Cutter-MacKenzie and Smith matrix, the participants ranged from ecologically illiterate to operationally ecologically literate. Of the 16 youth, six youth can be labeled ecologically illiterate, eight have nominal ecological illiteracy, and finally two have functional/operational ecological literacy.

The six ecologically illiterate participants presented trees that consisted of vague and confused links to the environment. The participants with ecologically illiterate trees had more biographical elements, showing their overall influences, rather than the environmental factors that have influenced them. For instance, one participant used magazine clippings to create her tree of ecological literacy including advertisements for Tiffany and CoTM. The participants with nominal ecological literacy trees referenced complex systems with an anthropocentric view.

These trees showed a minor level of understanding of environmental influences but were lacking in thoughtful reflection. Many nominal ecological literacy trees focused on the effects of local issues on themselves or their immediate families. The nominal group was committed to the remediation of environmental issues within an anthropocentric matrix such as fixing or "building a world we can all live in". Finally, two of the participants were categorized as functional/operational ecological literacy as their trees had a sophisticated expression of ecological understanding. These trees utilised concept mapping and themed association with ecological systems. The two participants both stated a commitment to environmental education and life-long learning.

The Trees of Ecological Literacy represent a snapshot in time of the student's environmental life before the students arrived at The Cape Eleuthera Island School. In conjunction with the Cutter-MacKenzie and Smith Matrix, the trees are most useful in evaluating the expression of ecological literacy.

Immersion
Danylchuk, Bachand, & Maxey (2004) discuss The Cape Eleuthera Island School as being successful because of the following pedagogical constructs: immersion, involvement, ownership and legacy. Indeed, these four principles play an integral role in the students' experiences at The Cape Eleuthera Island School. However, in my opinion, immersion is the key element in changing the level of expression and understanding of ecological literacy. From my observations, the participants increased in creativity as well as environmental awareness over the first four weeks of school life. Within the first four weeks of school, the participants were exposed to a series of sustainable living principles, ecology lessons, community outreach, and experiential learning opportunities including kayaking and SCUBA diving. Essentially, the participants were thrown

in the figurative "deep end" of Bahamian life. Because of this immersion, they began to use complex language and systems thinking in relevant and appropriate ways in their projects. In particular, they started to link their new knowledge of Bahamian ecology among their math, science, humanities and research disciplines.

The changes in the participants' ecological literacy due to the immersive process were most obvious within the course that I teach at The Cape Eleuthera Island School: Land and Environmental Art. This course allows the students to graduate from a place of knowing to a place of doing through artistic expression and reflection. For instance, the first major assignment in art contributed to the concept of the tree of ecological literacy requiring the participants to create an ecological self-portrait: ecoPortrait. The ecoPortrait incorporates intentional natural elements into a personal portrait through addressing the following questions:

- What elements of Bahamian ecology and land reflect your personality?
- How can you use nature to resemble or reflect who you are?

The differences I saw between the participant's Trees of Ecological Literacy and their ecoPortrait is astounding. Many of my participants commented to me that this "was my first time thinking about myself in the environment". Through photography and journaling, the majority of my participants graduated to an operational/functional level of ecological literacy. For instance, one participant had a very challenging time fulfilling his ecoPortrait. His goal was to take a photograph of himself holding a snake or anole. After approximately eight hours of searching he "then realized that looking for the animals was just as fun as actually catching them. This joy of the journey is my relationship with the environment".

Further to the immersive qualities of The Cape Eleuthera Island School, the place-based curricula encourages enrollment. Enrollment requires the generation of the spark of possibility within others and the willingness to receive a spark from others. The participants are given the ability to enroll in their surroundings through their academic curricula as well as their community dynamics, communications and interpersonal relations.

Integration
One of the major goals of The Island School is to integrate the curriculum and in doing so create a trans-disciplinary school. Each discipline feeds into the other curricula with a positive feedback loop allowing students to cross-reference and explore major themes using creative expression. Their inspiration derives from place and in particular the knowledge they have gained through the math, science, English, research, and history courses that all focus on The Bahamas.

Within the Land and Environmental art course, students have a level of creative freedom to explore their personal relationship to the environment. Creative freedom combined with the scaffolding of specific artistic skills creates an arena for a rich culture of ecological expression. My participants have utilised video, photography, performance, sculpture and mixed media to express their understanding of Bahamian ecology far beyond their pre-semester ecological literacy status. Immersion mixed with integration supports creative expression. However, a final piece that is necessary to long-term retention of this new knowledge is reflection.

Reflection
Each student at The Cape Eleuthera Island School is provided with a small blank journal, named a Placebook, which acts as a creative journal for helping brainstorm assignments, sketch concepts, and connect deeply with the environment around them. The placebook is a space for conceptualising ideas, recognising patterns and reinforcing learnt concepts. Hammond (2002) describes an environmental education journal as "a power tool for learning". Each discipline at The Cape Eleuthera Island School utilises the placebook with activities that are relevant to the student. For the participants, the placebook has become a sacred place, where personal reflection about their experience is recorded. Further to this reflection, the placebook acts as a tool to expand and explore observations, ideas and possibilities in written and graphical form.

In the beginning of the semester, the variability and quality of the participants' placebook entries corresponded with their level of ecological literacy. The ecologically illiterate participants had less diverse and creative entries. These entries typically use one type of writing implement and lists. The operational/ functional ecological literacy participants had diverse and rich placebook entries that utilised different media including watercolour, glued-in pieces of nature, and diagrams. Over the course of their time at The Cape Eleuthera Island School, the participants increased the diversity and quality of entries within the placebook. They were self-motivated to diversify their entries, adding their own interpretations to reflection and environment.

Conclusions
The immersive and experiential curriculum of The Cape Eleuthera Island School has immediate and substantive effects on the students. The expression of one's ecological literacy reinforces and supports the acceleration of one's learning curve in place-based environments. In particular, the Land and Environmental Art course can act as an extremely powerful tool for students to explore their creativity. In particular, students who are encouraged to take risks outside of their normal comfort zones in relation to their surroundings are able to act on their new knowledge in profound and useful ways.

Essentially, students are empowered through immersion, integration, reflection and a freedom to create. The curricula of The Cape Eleuthera Island School acts as an outstanding model for environmental education.

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Sowing the seeds – the role of botanic gardens in environmental education

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Abstract

Botanic gardens offer vibrant sites for learning. Evidence for this comes from a recent international survey carried out by Botanic Gardens Conservation International (BGCI) in September 2006. This paper will present the results of this survey and will highlight some of the innovative and imaginative programmes run in botanic gardens. It will also illustrate the value of developing partnerships with botanic gardens for education and encourage organisations to consider this in future projects. Finally, the paper will talk about the significant role BGCI plays in capacity building for environmental education through the provision of training courses, resources and conferences.

Introduction

There are over 2500 botanic gardens in 148 countries worldwide; over 500 botanic gardens in Western Europe, more than 350 in North America and over 200 in East and Southeast Asia, of which the majority are in China and India (BGCI website, accessed 1st June 2007). Between them they maintain collections of over 95,000 species of plants –1/3 of all known plant species of the world (BCGI, 2005). Botanic gardens play a key role in plant conservation through their work in horticulture, cultivation, seed banking, research and development, linking plants with the well-being of people, and helping conserve indigenous and local knowledge. One of the most important aspects of all this work is education: communicating the importance of plants, the need for their conservation and supporting societal change to achieve this to their wide audiences.

Survey of education in botanic gardens

Botanic gardens offer vibrant sites for learning. Evidence for this comes from a recent international survey carried out by Botanic Gardens Conservation International (BGCI) in September 2006. The aim of the survey was to examine the current status of education in botanic gardens. It looked at a wide range of issues such as the numbers and types of audiences reached, the type of education provision offered, whether evaluation is used and what messages are communicated. The survey also focused on the staffing levels of educators in botanic gardens, how much time is spent on education per week and which departments within gardens are involved with education provision. Over 120 responses to the survey have been received and analysed, providing a fascinating picture of education in botanic gardens worldwide.

The survey outcomes demonstrate the importance education has in botanic gardens, the audiences and themes they are addressing and the methods they are using to do so:

- 91% of gardens include education in their mission or vision statements
- 68% have a budget allocated specifically for education and education provision
- 71% of gardens have a dedicated education team, the numbers of hours they work is variable, but this shows again that education is an important part of the work of botanic gardens. Even if there is no education team, most sites still carry out education work through their volunteers or horticultural department.

Botanic gardens aim their education provision at a wide range of audiences, the most common being:

- School children aged 5- 11 (85%)
- School children aged 11- 16 (85%)
- University students (81%)
- School children aged 16-18 (78%)
- Families (74%)
- Tourists (66%)
- Community groups (63%)
- School children aged 0 -5 (58%)
- Professional educators (57%)
- Senior citizens (49%)

The specialist knowledge within botanic gardens is reflected in the themes that they address within their programmes:

- Plant diversity - 90%
- Conservation – 84 %
- Ethnobotany – 78%
- Plant science – 76 %
- Endangered species – 74%
- Horticulture – 65%

Issues such as climate change, food security, fair trade and poverty alleviation are less commonly addressed. However, this could provide potential for partnership programmes; if another environmental education site has expertise in teaching about climate change, but wants to learn more about the impact of climate change on plants, then partnering with a garden, for example by running a joint training day or participating in shadowing work, could be useful for both organisations.

Other findings from the study which might be appropriate when considering the potential of botanic gardens for partnership programmes include the methods gardens use to communicate and the areas in which they have the most experience and success. The most popular forms of communication in gardens are:

- Guided tours, used by 92% of gardens
- Talks and lectures, used by 78% of gardens
- Exhibitions – 69%
- Interpretation panels – 65%
- Leaflets – 67%
- Workshops – 63%

This clearly demonstrates that botanic gardens have a wealth of expertise in interpretation and communication. Increasingly, this experience is seen as important for increasing understanding and connection to the environment, and the collections within botanic gardens lend themselves perfectly to teaching about the local environment and its global context (Willison 1994). The results of this survey also suggested that botanic gardens tend to be quite well-resourced; this may also be of benefit to a partnership programme. Botanic gardens are normally secure sites with open green space: 80% have toilets, 73% have plant material available to use for education, 63% have libraries, 63% have classrooms and 57% have exhibition space. Other facilities include refreshment areas, education centres, artefacts, lecture theatres and so on (Kneebone & Willison, 2007).

Case studies - Education programmes in botanic gardens
It can be seen from this survey that botanic gardens are investing resources, staff and facilities into their education provision and that these programmes are largely focused on environmental issues. Four case studies help to provide a taster of the innovative and exciting work garden educators are carrying out:

Fairchild Challenge – Community Contact, Fairchild Tropical Botanic Garden, USA
The Fairchild Challenge is a competitive, multidisciplinary environmental education programme for teenagers, composed of a series of dynamic activities and projects called Challenge options. These give teenagers opportunities to research, write, debate, create, perform, interview, imagine, speak out, design, build, conserve, and ultimately improve their botanical and environmental awareness, scholarship and stewardship.

The Fairchild Challenge is launched at the beginning of each school year, and ends with an Awards Ceremony in May where all schools surpassing the annual goal of points are presented with the Fairchild Challenge Award. The programme was initiated as a pilot in 2002 and the response by teachers and students has been extremely heartening. From 1 400 high school students in its first year, the Fairchild Challenge now engages over 16 500 middle and high school students annually.

The Fairchild Challenge allows the garden to reach broad audiences of learners at the middle and/or high school level, in a wide variety of schools and the teacher training that accompanies the scheme helps to influence pedagogy and promote interdisciplinary learning. The subjects and Challenges the students undertake promote civic-minded thinking on local and global issues and

involve local organisations and institutions whilst also celebrating teenagers as gateways to communities. The garden also uses the programme to ensure inclusion of funders, sponsors, donors and offers annual training courses to promote the programme as a replicable model (Lewis, 2006).

Cultivating urban ambassadors for nature: Foundation for the Revitalisation of Health Traditions, Bangalore, India
This programme was developed in order to engage young people with the plants of their immediate neighbourhood, ensuring that the scheme was relevant and immediate for the participants. The designers met the need to encourage students to think globally and act locally by connecting students with the medicinal value and traditional knowledge associated with these plants. A combination of CD-Rom prototype with outdoor-based activities such as nature walks, observation studies and project work was initially tested with both students and teachers. Working with the teachers, FRLHT developed learning objectives for the nature walks and trails and project works. These objectives focused on developing observational, data organisation, data collection and analysis skills as well as improving communication skills and developing empathy and positive behaviour and attitudes towards the environment (Tagadur, 2007).

Partnership with healers: IB-UNAM Botanic Garden, Mexico
A well-established collaborative programme at one of the university botanic gardens in Mexico City allows ethnobotanists to share their technical and botanical expertise while traditional healers share their knowledge on the traditional and ritual use of plants. This type of partnership has enabled the botanic garden to make this knowledge available to other healers, housewives, professionals and alternative health practitioners in Mexico (Linares, 2006).

The outreach greening programme, Kirstenbosch Botanic Garden, South Africa
This programme was developed in 1997 at Kirstenbosch Botanic Garden to develop indigenous water-wise gardens at schools and to use the garden as a teaching and learning resource to incorporate environmental education into the curriculum. The programme utilises a systemic approach to transfer a range of skills to 'Green Teams' (consisting of students, educators, grounds personnel and community members at school) to successfully develop and sustain their garden. Practically orientated workshops consist of basic horticultural training processes which include garden design, soil preparation, plant propagation, plant maintenance etc. These are followed by workshops that include garden interpretation and lesson plan development by teachers.

Kirstenbosch's environmental education programme has always played a crucial role in supporting educators as a service provider in the implementation of the education transformational processes, specifically Outcomes Based

Education and the National Curriculum Statement (NCS) policies. Currently, the garden supports educators with the implementation of the NCS within the South African National Biodiversity Institute's context through a process of participatory action research. As part of post-graduate research, staff members collaborate with teachers and curriculum advisors from the provincial education department in the development of new and special programmes, teaching and learning support materials etc. The process of working with educators is seen as a vital component to ensure the sustainability of the projects at school (Fullard, 2006).

Global Strategy for Plant Conservation
One of the reasons botanic gardens are supportive of the importance of education is the *Global Strategy for Plant Conservation*. This is a document which outlines a series of targets through which the ultimate aim of halting the current and continuing loss of plant diversity can be achieved. The strategy provides a framework to "facilitate harmony between existing initiatives aimed at plant conservation, to identify gaps where new initiatives are required, and to promote mobilisation of the necessary resources." Its mission is to "be a tool to enhance the ecosystem approach for the conservation and sustainable use of biodiversity and focus on the vital role of plants in the structure and functioning of ecological systems" (SCBD, 2002).

Target 14 is one of 16 targets within the strategy. Target 14 states that: "The importance of plant diversity and the need for its conservation should be incorporated into communication, educational and public-awareness programmes." This target is of most relevance to educators. The work that environmental educators carry out, wherever they are in the world and whoever their audience, supports the achievement of Target 14 and should be recognised as such by their governments. For more information on Target 14 and the Global Strategy for Plant Conservation, visit the dedicated website, www. plants2010.org.

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BGCI's role in capacity building for education and plant conservation
BGCI is a not-for-profit organisation that networks plant conservation organisations worldwide for plant conservation. It provides support materials, including websites, biannual journals – the education review 'Roots', a quarterly newsletter, manuals and guidelines. BGCI runs a series of courses and workshops on education, examining education for sustainable development, creating education master plans, addressing audiences, designing exhibitions, developing teacher training programmes, evaluation and interpretation.

Every two years training is provided through the International Diploma on Education in Botanic Gardens in association with Royal Botanic Gardens, Kew. The International Congress on Education in Botanic Gardens is held every three years and focuses on the key issues of environmental education – examining the impact and contribution to the Millennium Development Goals, the Global Strategy for Plant Conservation and sustainable development. In addition to these activities, the website has many resources, articles, how-to guides, information, contacts, links and the full archives of Roots available to download for free – www.bgci.org.

Conclusions
Botanic gardens are located around the world, most situated in major cities and many in urban areas. Their remits include education and they have resources and experience in communicating with a range of audiences, using a range of techniques and benefiting from extensive resources. Some of their programmes are highly innovative and address the major issues facing the environment. Networking and partnerships with botanic gardens has a lot of potential for developing new programmes and to benefit the environmental outcomes desired by both kinds of organisations. BGCI provides material, training courses and resources to support environmental education, much of which is available to download for free from the website, www.bgci.org.

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9 | Civic Ecology Education: A Systems Approach to Resilience and Learning

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Abstract

Resilient social-ecological systems demonstrate diversity, self-organisation or participation, and adaptive learning. Civic Ecology Education programmes incorporate these same attributes with the goal of fostering resilient communities. Diversity refers to types of knowledge, ecology and cultures. Participation refers to civic action. Adaptive learning occurs when programmess learn through experience and networking. Civic Ecology Education programmes also build on existing community assets, such as adults engaged in creating urban community green spaces and, through educational interventions that create positive feedback loops, these assets are further strengthened.

Introduction

The term resilience refers to the ability of a social-ecological system to maintain itself in the face of large-scale perturbations such as disaster and conflict, as well as more gradual changes in the environment, demographic shifts and other factors. Because change is inherent to all systems, resilience is an integral component of sustainability (Folke et al., 2002). The relationship of resilience to sustainability is further spelled out in the following quote:

> (M)anaging complex, coevolving social-ecological systems for sustainability requires the ability to cope with, adapt to and shape change without losing options for future development. It requires resilience—the capacity to buffer perturbations, self-organize, learn and adapt. When massive transformations occur, resilient systems contain the experience and the diversity of options needed for renewal and development. Sustainable systems need to be resilient (Folke et al., 2002, p. 22).

In this paper, we ask the following question: Given that resilience is integral to the sustainability of social-ecological systems, what contributions can environmental and related forms of education make to resilience? We address this question by first describing the attributes of resilient systems. Next we describe an example of a community-based initiative or asset, i.e., urban community greening, that embodies these attributes. Then we describe how the Garden Mosaics urban environmental education program leverages this community asset and incorporates the resilience attributes to foster resilient communities. Finally, we propose a broader Civic Ecology Education as an approach to fostering resilience in social-ecological systems.

Resilience in Social-Ecological Systems

Systems scholars have cited three attributes as being fundamental to the ability of a society to respond to changes such as disaster and conflict, including: (1) the amount of change the system can undergo and still retain the same controls on function and structure, (2) the degree to which the system is capable of self-organisation, and (3) the ability to build and increase the capacity for learning and adaptation (Walker et al., 2001). We discuss each of these briefly below.

Diversity is fundamental to retaining functional and structural controls in the face of disturbance and thus to buffering the impact of catastrophic and other changes (Folke et al., 2002; Perrings, 2006). Biological diversity provides functional redundancy, so that if one species declines (e.g., a nitrogen-fixing species), other species providing the same ecosystem services will continue to function (Levin, 2005). Similarly, when diverse groups of stakeholders, including resource users from different socio-economic classes or ethnic groups, scientists, community members, NGOs and government officials, apply their unique forms of knowledge and experience to shared resource management, decision-making may be better informed, stakeholders may be more invested in and supportive of the decisions, and more options may exist for testing and evaluating policies.

Self-organisation refers to the emergence of macro-scale patterns from smaller-scale rules, such as the emergence of ecosystem patterns related to nutrient cycling or plant size distributions as a result of evolution acting at the species level (Levin, 2005). Participation of local residents in managing their own resources also may be viewed as a form of self-organisation (Olsson et al., 2004). When stakeholders are open to learning from their experience, and strategies are put into place to facilitate such learning (e.g. networking), participation can lead to adaptive learning. Taken together, biological and socio-cultural diversity, participation and adaptive learning foster resilience.

Urban community greening

Urban community greening refers to the leadership and active participation of city residents who take it upon themselves to build healthier sustainable communities through planning and caring for "socio-ecological spaces" and the associated flora, fauna and structures. This definition is distinct from other definitions of greening, which may include green political movements, or more formal "pedigreed" landscapes such as city parks and botanic gardens (Hough, 2004). It also is

distinct from some forms of urban agriculture in its emphasis on human, social and natural capital. Urban community greening encompasses community gardens where city dwellers share a garden space, often by dividing it into individual family plots and common areas such as benches and casitas; memorial gardens created spontaneously by community members following disaster and conflict; trough gardens where individuals plant in troughs located throughout a city; gardening and tree planting along green areas created by transportation corridors such as railroads and highways; as well as sacred groves of trees and other forms of community forestry. Whereas greening in general enhances mental, physical and community health, urban community greening builds natural, human, social, financial and physical capital in unique ways with important implications for creating resilience prior to and following a disaster or conflict.

A particularly well-known example of urban community greening comes from Soweto township near Johannesburg, South Africa, where local residents, many of them immigrants from more rural areas, have taken it upon themselves to reclaim a hill that was overgrown and the scene of rampant sectarian violence during apartheid (Lindow, 2004). Today the Soweto Mountain of Hope is a vibrant garden and outdoor 'community center' incorporating protest sculptures, a women's kitchen and meeting circle, dance and drumming classes and concerts, and huts reflecting the building styles of diverse ethnic groups in South Africa. The Soweto Mountain of Hope also acts as a memorial to victims of AIDS; the garden is along a major thoroughfare leading to a large cemetery and a number of plots are planted in the shape of AIDS ribbons. Given Johannesburg's high crime rate and its designation by some as a city at risk of "failing" (Norton, 2003), the Soweto Mountain of Hope is an example of community-based resilience under conditions that commonly follow disaster or conflict. It also provides a test case for how such community-based efforts might enhance resilience in the face of future conflict.

Similar to what one can observe in Soweto, the community garden movement in North America can be viewed as a community-based response to urban crime and decay. As city dwellers in New York City and elsewhere experienced rising violence and abandonment by politicians in the 1970s, they refused to accept that they and their neighborhoods were the "troubling by-products of urban growth and decay... problems to be solved by politicians, city planners, and environmental professionals" (Anderson, 2004). Instead, they took it upon themselves to transform crime- and trash-ridden vacant lots into urban landscapes that represented a new kind of nature incorporating ecological and cultural value. We contend that the active engagement of these community members, many of whom were low-income minorities

and immigrants, helped to build stronger, more resilient neighborhoods prior to disaster, and that their efforts would be revisited following disaster. For example, after 9/11, many community gardens became living memorial gardens, whose purpose was to create an outlet for grief and a unifying, community-building demonstration of solidarity and support, all of which can contribute to resilience.

Urban community greening and Resilience
Urban community greening in the USA and other countries embodies the resilience attributes through incorporating diversity, self-organisation, and adaptive learning. Furthermore, urban community gardens provide a unique context for environmental education because they integrate western science and indigenous knowledge (or diverse forms of knowledge), local biodiversity and community action (or self-organisation). In the USA, the gardeners at these sites often are new immigrants from Latin America, the Caribbean and Asia, as well as African-Americans who migrated to cities from the rural southern states in the US; these individuals bring with them a form of "indigenous" or "traditional ecological" knowledge of plants and planting practices which they adapt to the new urban sites where they have relocated. University extension programs and local NGOs often provide support to the gardeners in the form of science-based knowledge about management of soil toxins, composting, water capture systems and invasive species control.

Community gardens incorporate civic participation or community action at multiple levels. At the level of the individual site, gardeners organise amongst themselves to make decisions about dividing up the space within the garden and about rules concerning pesticide and fertilizer use and weed control. Gardeners also contribute to the larger community through donating produce to food kitchens for the homeless and to elderly homebound neighbors, as well as through organising educational, social and cultural events (e.g., harvest festivals and concerts). Perhaps most importantly, community gardens often are the result of local people taking control of their own deteriorating urban neighborhoods, which have been abandoned by government and business interests. As local people reclaim these blighted, vacant lots in cities, they embody a form of community-based self-organisation that presents an alternative to dependence on formal institutions (Folke et al., 2002). Subsequently, as economic conditions improve and the neighborhoods they have created become more desirable, community gardeners often join advocacy groups to conserve garden spaces threatened by commercial development.

Throughout this process, community members are learning adaptively from their greening and advocacy activities. Government agencies and NGOs often facilitate such

learning through organising greening conferences and related networking.

Garden Mosaics Urban Environmental Education Program
Garden Mosaics (www.gardenmosaics.org, accessed 19/4/2007) is an environmental education program that seeks to "connect youth and elders to investigate the mosaics of plants, people, and cultures in gardens." The learning activities take place largely in urban community gardens and draw on the biological and cultural diversity, civic participation and activism that occur at these sites. The Garden Mosaics youth activities include:

i -m -science investigations
- *Neighborhood Exploration*, in which youth explore the assets of their community using spatial images, observations and interviews of local residents while walking around their neighborhood.
- *Gardener Story*, which entails interviewing gardeners, many of whom are immigrants or internally-displaced persons (e.g., African-Americans who have moved from farms to cities), about the biodiversity they have created through planting a garden, and about the connections of those planting practices to cultural traditions.
- *Community Garden Inventory*, in which participants list the activities and other benefits community gardens provide for their neighborhood; and
- *Weed Watch*, designed to collect data about weed problems and gardeners' weed control methods.

Action Projects in which youth apply what they have learned in their *i -m -science investigations* to enhance their neighborhood or local gardens. For example action projects include youth building a handicap-accessible raised bed, planning a neighborhood garden festival, donating produce to food kitchens, creating a plant sculpture in a garden, or sharing what they have learned with younger children.

Short-term inquiry and other learning activities ranging from using "Science Pages" to learn more about the science behind what they learn from gardeners, to blog exchanges with youth overseas.

Youth submit reports and photos from their *i -m -science investigations* and Action Projects to the Garden Mosaics website, where they can be used to help others learn about community gardens and biological and cultural diversity. These and other resources on the website and a related online forum create opportunities for educators to learn from each other's practices.

Garden Mosaics was originally developed for US audiences but has been adapted in South African township schools where community members were growing food. The learners at these schools interviewed the gardeners about what they were growing and about their needs, and then designed a marketing strategy for their produce (Liddicoat et al., 2007).

Civic Ecology Education
Through integrating our Garden Mosaics work with resilience theory (www.resalliance.org) we have initiated a new Civic Ecology Education. The goal of Civic Ecology Education is to build resilient communities through enabling youth and adults to develop an understanding of biological and cultural diversity and of diverse forms of knowledge and to apply that understanding to becoming informed, active and contributing members of their community. Adaptive or social learning is also integral to Civic Ecology Education programs (Tidball & Krasny, 2007). Through creating networks or "learning communities" of educators and researchers who share their experiences, knowledge and skills, this social learning furthers our understanding of best practices for environmental education programmes that foster resilience. Thus, Civic Ecology Education programs integrate the three attributes of resilient socio-ecological systems (Table 1).

Table 1. Resilience Attributes (Walker et al., 2001) and Civic Ecology Education

Resilience Attributes	Civic Ecology Education
Diversity	Programmes incorporate diverse forms of knowledge (western scientific and traditional) Youth and adult participants represent diverse cultures Programmes take place at sites with biodiversity
Self-organisation	Activities include local actions and advocacy to improve the community and environment
Adaptive learning	Within one programme, educators and youth learn how to conduct better programmes and how to improve the environment Across programmes, educators share what they have learned

To accomplish its goal of contributing to community resilience, Civic Ecology Education uses a systems approach, incorporating asset-based thinking and positive feedback loops (Figure 1). It draws upon, and through a series of feedback loops, furthers positive activities within a community. In this way, Civic Ecology Education offers an alternative to youth education programmes that focus on the weaknesses of urban communities.

Garden Mosaics provides numerous examples of drawing on and furthering existing strengths within a community. For example, when adult community members turn vacant lots into gardens, they have taken control of blighted land within their neighborhood and turned it into spaces where people gather to socialise,

grow food and enjoy nature; thus, community gardeners have created an important community asset. When youth in a Garden Mosaics program then work alongside these older gardeners and learn from them, the gardeners in turn become involved in youth education, thus further strengthening their community (Figure 2). Youth in Garden Mosaics who conduct Action Projects, such as advocating for more green space or creating new gardens, also may help create strong or resilient communities (Figure 3).
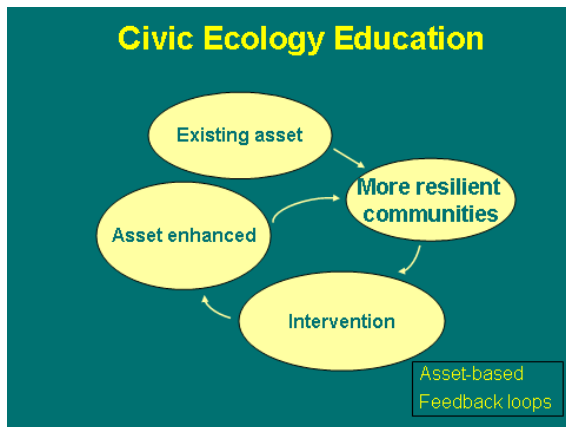

Figure 1. Feedback loops in Civic Ecology

Figure 2. Civic Ecology Education furthers the involvement of adults in their community

Figure 3. Youth in Civic Ecology Education programs contribute to community resilience.

Note that Civic Ecology Education builds on and enhances community assets at multiple levels, including the individual, social and natural. At the individual level, youth may gain more critical thinking skills through inquiry-based science learning and community action, and apply those skills to furthering their own academic success and to enhancing their communities. At the societal level, Civic Ecology Education can foster intergenerational learning, recognise diverse forms of knowledge present in a community, and promote civic participation or self-organisation. Environmental assets can be enhanced through gardening, monitoring local resources and creating new green spaces. At the same time, enhancing assets at one level may lead to greater capital at another level, such as in the example above where community gardeners create green spaces which in turn promote youth development, and the youth then create improvements to those spaces. Given the importance of resilience and social and natural capital to urban sustainability (ICLEI 2006), Civic Ecology Education plays a critical role in building sustainable cities.

As part of our work with Civic Ecology Education, we currently are seeking to identify additional examples of activities in which urban residents integrate biological and cultural diversity and civic participation, and then to work with community-based organisations to create educational programmes around such activities. Water quality, bird populations, and other monitoring programs that actively seek out the knowledge of local residents (e.g., the knowledge of fishermen in a water quality monitoring program) and that incorporate an action project (e.g., conserving habitat in addition to monitoring wildlife populations) may become part of a Civic Ecology Education toolkit. Similarly, agricultural education programmes such as Farmers of the Future that integrate traditional and western scientific knowledge and implementing more sustainable food growing practices, and that include exchange of ideas and practice with other countries, may contribute to a Civic Ecology Education toolkit. As we seek examples of such programmes from around the world, it becomes important to design adaptive learning strategies to determine the impacts of such programs on the youth, elders and educators directly involved, as well as on the resilience and sustainability of the larger community.

Conclusion
We hope that the ideas presented in this paper will be a first step in developing a social-ecological systems approach for viewing the relationship between environmental education and community-level outcomes in cities. In essence, we argue that in urban settings we can find communities that embody the diversity, self-organisation and adaptive learning resilience principles; that educational programmes can be designed to build on and embody these assets; and that such education programs will in turn enhance resilience and sustainability in these same communities

(Figure 4). This systems approach to environmental education draws from and offers an alternative to models focusing on individual behavioural change, including those which assume that by changing individual behaviours we create healthier environments (e.g., Hungerford & Volk, 1990) and those which have demonstrated the positive impact of nature on individuals (e.g., Kuo & Sullivan, 1998; Kuo et al., 2001).

In conclusion, we are proposing a systems-based approach in which education draws from the assets and is critical to the sustainability of social-ecological systems.

Perhaps another way to look at these interrelationships is to ask what would happen if Civic Ecology Education programs were removed from social-ecological systems, in particular urban systems where humans predominate. We argue that the impact would be significant in terms of reducing resilience, in part because in urban systems more natural processes that foster resilience in rural areas (e.g., healthy soils, forests) have been replaced by humans. Thus, education and other human activities that foster diversity, self-organisation and adaptive learning may be more critical to resilience and sustainability in urban systems than in other systems.

11

The role of environmental education in AIDS education
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Abstract
Recent thinking has emphasised the need to consider the impact of HIV and AIDS beyond health and biomedical concerns, to how AIDS undermines sustainable development through increasing poverty, food insecurity and natural resource use. Similarly, environmental education is increasingly cognisant of the links between sustainable development and the environment. This paper argues that environmental education provides a platform for strengthening AIDS education in schools. The paper draws on research conducted by the author into AIDS and the environment, in three rural South African contexts. Food security, psycho-social support and indigenous knowledge are introduced as useful concepts, familiar to environmental educators, which could be used to address AIDS through the environment.

Introduction
Over the last three decades, the response of the global community to AIDS has evolved from a largely bio-medical approach (prevention, treatment) to the recognition that AIDS is a "development" issue – evident in socio-economic, political and also environmental spheres. In similar ways, environmental education has evolved from an emphasis on nature and biophysical phenomena, to a more integrative discipline that is "value based", seeing the environment as reflected in social transformation (socio-economic and political change) and development issues (O'Donoghue, 1997; Lotz-Sisitka, 2004). Environmental education and strategies for understanding and responding to AIDS thus hold in common a cognisance of how community health is articulated through the natural environment.

The impacts of AIDS also have direct, explicit links to the natural environment. It has been suggested that AIDS acts as a "shock" to rural households, causing an increased reliance on natural resources for food security and income generation (Barany, Hammett, Stadler & Kengni, 2004). There is some evidence that "free" natural resources act as a safety net in times of social, economic or ecological hardship (Angeksen & Wunder, 2003), and that during such times households increase their consumption and/or sale of these free resources, to tide them over until better conditions return (Angelsen & Wunder, 2003; Paumgarten, 2005 and 2006). This can be for income-generation from sales (Shackleton, 2006; FAO, 2004) or through the way in which local people harvest natural resources to ensure food security (Du Guerny, 2003).

This paper argues that environmental education and AIDS education should enjoy a greater overlap than is currently evident in South African schools. It is suggested that the aims of environmental education and the aims

of AIDS education have much in common, in that both educational approaches are underscored by the principles of promoting sustainable development, robust livelihoods and comprehensive community health. What is more, through the explicit tie between AIDS as a livelihoods and food security issue, and natural resource use, linking environmental education and AIDS education is a direct approach to addressing one of the most important current and future drivers of environmental change in southern Africa.

Current responses to AIDS
AIDS is impacting not only on the quality of education many children are receiving (Foster & Williamson, 2000; FAO, 2005) but also on our very understanding of what education should entail. Kelly (2000a) argues that "Education in a world with AIDS must be different from education in an AIDS-free world. The content, process, methodology, role and organization of school education in a world with AIDS must be radically altered. The entire educational edifice must be dismantled." Consequently, there is a great burden placed on teachers in the fight against AIDS. Education is considered key not only in increasing awareness of the bio-medical condition and thus lowering the risk of infection, but also as a process to allow learners to derive strategies for dealing with infection, and for "coping with grief and loss" and "re-organising family and personal structures after death" (Kelly, 2000b).

In South African schools, a response to this challenge was initiated in 1995 in the form of the Life Skills and AIDS Education Program for secondary schools. The education program demands that teachers balance content on AIDS (e.g. transmission, prevention, etc.) with shaping learners' skills, values and attitudes. A strong emphasis is also placed on counselling and psycho-social support.

In South African schools, implementation of this programme is proving to be difficult for a number of reasons (Mannah, 2002). For one, the programme is generally under-resourced, with the better-resourced schools experiencing the most benefits (Visser, 2002). Secondly, in the school curriculum, issues relating to sexuality and AIDS infection are mainly confined to the Life Orientation learning area. In a survey of high schools in Cape Town, 59% of teachers with an AIDS programme in their classroom taught Life Orientation (Mathews et al., 2006). Although Life Orientation includes AIDS education in its learning outcomes, it is unlikely that the devotion of a few learning outcomes to AIDS prevention and mitigation constitutes the "radical reorientation" of education to AIDS issues on the scale suggested, or assists teachers

in dealing with not only the immediate psycho-social effects on learners, but also the broader social, economic, environmental and political issues that will affect learners' resilience in coping with the effects of the disease.

Current environmental education responses to AIDS
Given the massive importance that AIDS education has been assigned in mitigating the impact of the disease, it is noteworthy that AIDS has been given so little attention in environmental education programs. In 2006, the SADC Regional Environmental Education Program recognised the need for more explicit links between poverty, environment and AIDS in environmental education, and commissioned a ten-country case study research project to investigate the relationships between AIDS and environmental education and recommend appropriate guidelines for responses.

As an intermediate response, the author conducted a case-history research exercise with facilitators of environmental education through the NGO-run Eco-Schools programme to probe environmental educators' experiences of dealing with HIV and AIDS issues within the Eco-Schools program. Most facilitators admitted to feeling "overwhelmed" when asked to assist schools in dealing with AIDS. Knowledge of "AIDS education" was confined to the bio-medical aspects of the disease, and facilitators frequently found themselves stepping out of their environmental niche and offering (at times misinformed) advice on prevention, disease epidemiology and treatment (Kaschula, 2007). There was an acute need to make the links between the environment and AIDS explicit, and outline practical ways in which environmental educators might engage with AIDS issues in a way that escapes from the typical "content and council" based approach that typifies conventional AIDS education. In the sections that follow, the insights of the case history research (Kaschula, 2007a), as well as other research on AIDS, livelihoods and food security (Kaschula 2007b, McGarry & Kaschula, 2007; McGarry, 2007) are drawn upon to inform a number of recommendations to assist environmental educators in building a more explicit AIDS-oriented approach into environmental education.

Suggested environmental education responses to AIDS
Environmental education for food security
In case history research with Eco-Schools facilitators, it was found that many facilitators did not think that environmental education activities, such as food gardens and the promotion of the sustainable use of the environment for rural food security, constituted strategies for "dealing with AIDS". It is therefore recommended that a critical part of building environmental issues into AIDS education is creating awareness that food security is *both* an environmental issue *and* an AIDS issue (Kaschula, 2007a). Research conducted by Kaschula (2007b) has shown that AIDS-afflicted households at three sites in rural South Africa were consistently more food insecure than non-afflicted households. In a range of developing countries, studies have consistently indicated that AIDS is profoundly affecting the ability of households to secure

adequate food and nutrition. There are a number of reasons for this. Firstly, AIDS is understood to impact negatively on agricultural productivity through depletion of human resources, diversions of capital from agriculture, loss of farm and non-farm income and other psycho-social impacts that affect productivity, greatly diminishing the resilience of food security systems (Barnett & Blaikie, 1992; Mutangadura, Mukurazita and Jackson, 1999; Drimie & Gandure, 2005). Secondly, AIDS is also believed to impact on food security through its unique effect on household demographics, because unlike "normal" shocks, where the weak and the dependant would die first, dependency ratios in AIDS-afflicted households would be adversely affected (De Waal & Whiteside, 2003).

Lastly, the biomedical condition of HIV and AIDS as a food security shock is in itself a threat to food security. HIV and AIDS increase vulnerability to food quality and food quantity insecurity, which in turn heightens susceptibility to infection and exacerbates the bio-medical effects of the condition (Gillespie & Kadiyala, 2005).

In many developing countries, use of the natural environment is strongly tied to food security, as subsistence cultivation of natural resources is inherent in rural livelihoods. However, many rural peoples in southern Africa live in savannas or grasslands, areas not deemed suitable for subsistence agriculture. In these environments, research has shown that rural people are still highly reliant on natural resources for food security, despite the absence of conventional farming activities. This is mainly through the collection, trade in and direct consumption of wild foods. A review by Shackleton and Shackleton (2004) indicated that 96 % of rural households made use of wild edible herbs to some extent, with a mean of 58 kg per year. In research by Kaschula (2007), 52% of households had consumed at least one non-cultivated (wild) food in the previous 48 hours.

The impact of AIDS on the relationship of rural people to natural resource use should be one of interest and concern for environmental educators. Uncultivated or wild natural resources are often more frequently eaten by poorer and more vulnerable sectors of society (Cavendish, 2000; Angelsen & Wunder, 2003; Paumgarten 2005; Kaschula, 2007a), which provides a strong motivation for environmental educators to include information on wild foods in AIDS educational activities aimed at mitigating impacts of the disease on the poor and the vulnerable. If correctly promoted, wild foods may have the potential to interface positively with an AIDS nutrition feedback loop. Those infected with HIV typically require up to 15% more energy and 50% more protein to prevent the onset of AIDS and secondary infection and to minimise wasting (Beisel, 2002; Friss, 1998; Haddad & Gillespie, 2001). Wild foods in the form of bushmeat, insects and nuts are good sources of protein, and wild vegetables are also key sources of nutrients, and often exceed cultivated vegetables in nutrient content (Kinyuy, 2001; Schippers,

2000). Moreover, it has been suggested that the increase in fallow land that usually accompanies the onset of AIDS in rural areas may provide a regenerative niche for wild and naturally occurring food products (Du Gurney, 2002; Dwasi, 2002; FAO, 2003; FAO, 2004; Mphale, Rwambale, & Makoae, 2002; Shah, Osborne, Mbilizi & Vilili, 2002).

Studies on existing AIDS education approaches have consistently found that learners are "tired" of the "same old approaches" to teaching AIDS education in life orientation classes (Griessel-Roux et al., 2005; Kaschula, 2007b). Environmental educators have considerable experience in promoting food gardens for community health (Le Roux et al., 1997). Introducing such activities into AIDS education offers a fresh, new way of tackling AIDS education. AIDS education can be brought into Life Orientation learning areas that do not explicitly mention HIV/AIDS (for example, where learners are asked to compare nutritional values of foods derived from traditional versus non-traditional menus). Food garden exercises can also be used to introduce AIDS education into other learning areas (for example, food garden yield and output calculations in measurement learning outcomes in the Mathematics learning area, and exploration of biological process and sustainability of resource harvesting in the Natural Sciences, Social Sciences and Technology learning areas).

Environmental education for psycho-social support
Enhancing learners' self-esteem and inter-personal relationships is a strong orientation of the South African Government's AIDS education program. Although the psycho-social aspect of AIDS education is deemed one of the most important aspects of the program, studies suggest that this is also one of the most neglected facets. In one study, 27% of rural children did not have an adult or friend to talk to when they had problems (Visser, 2003). However, as Visser et al. (2002) note, most teachers do not see counselling as part of their job description.

Even if teachers were willing to take on the role of counsellors, there are indications that the role of a teacher as counsellor has questionable value. Research has indicated that learners learn best from their peers, especially on issues of sexuality and health (Mannah, 2002; Visser, 2005). Consequently, teachers have been encouraged to adopt peer education techniques when implementing the Life Skills programmes (Mannah, 2002). However, Visser (2005) has shown that problems with formal peer education approaches include a need for ongoing teacher support and buy-in from teachers, which is complicated by the apparent unwillingness of teachers to devote the necessary time. Moreover, a very secure and stable school environment is needed to make peer education processes initiated within a formal institutionalised schools structure sustainable and successful (Visser, 2005).

What can environmental education offer teachers struggling to reconcile the need for peer education and psycho-social support in their AIDS education activities? Research conducted by McGarry and Kaschula (2007) on children made vulnerable to the effects of AIDS in three South African rural areas has generated some insights into this problem. McGarry and Kaschula (2007) have found that in a number of rural areas in South Africa, peer groups are evident as support structures for dealing with issues of food insecurity and psycho-social vulnerability amongst AIDS-afflicted children. However, unlike the formalised, purposely formed and school-structure dependent peer groups described by Visser (2005), the peer support groups described by McGarry and Kaschula were not formed through school encouragement or support. McGarry (2007) has indicated that these spontaneously formed children's support groups are clustered around the use and exploitation of the natural environment. McGarry has found that boys especially form peer groups, and engage in outdoor activities, such as the hunting of small wild animals and the collection of natural resources. In the Eastern Cape, 60% of children interviewed by McGarry were personally acquiring one wild meat meal per week.

McGarry (2007) has suggested that these spontaneous peer group activities are an important and often successful strategy for coping with vulnerability in rural areas, and engendering a sense of empowerment and self-sufficiency in children afflicted by AIDS. McGarry found that children from very AIDS-afflicted households showed 15% more use of natural resources for recreation and subsistence consumption than the less vulnerable children. Moreover, unlike formalised AIDS peer group support interventions, these groups were robust, effective, and required no teacher intervention.

The idea of "nature" as a medium for facilitating personal empowerment is not new. For example, the concept of "Nature therapy" operates on the premise that if people develop an awareness and reverence for life, they will also develop self-understanding and self-respect (Nebbe, 1991). In a developing world context, nature therapy may be criticised for its tendency to articulate through a typically Euro-centric paradigm of the "intrinsic" value of nature. The suggestions of McGarry (2007) take nature therapy into an African context, suggesting that nature is not only "therapy" in rural areas, but an intricate part of the identity, agency and self-efficiency of rural children. Apart from their "intrinsic" or "psychosocial" value, the resource collection activities of rural children constitute important strategies for food and livelihood security. These strategies are particularly critical for those made vulnerable by AIDS-aggravated food insecurity.

Environmental education for indigenous knowledge
Current research indicates that very few programmes on AIDS education seek to contextualise messages about AIDS within the local cultural discourse, failing to build upon the understanding and beliefs of those they seek to influence (Kippax, Smith & Aggleton, 2000). Mokuku (2004)

suggests that education must foster "physical and spiritual" connections between people and their environment, and that indigenous knowledge as articulated through environmental education approaches is the only way to achieve this. Maila and Loubster (2003) maintain that indigenous knowledge systems are invaluable in an education system that envisages integrating all "processes of knowing". Building on indigenous knowledge has been highlighted as a critical component of AIDS impact mitigation (Quinlan, 2004; Gari, 2003; SADC FANR VAC, 2003). It would therefore be appropriate for AIDS education programmes to be built upon the indigenous knowledge already evident within the school community.

Environmental education has emphasised the importance of indigenous knowledge, and seems an appropriate vehicle for assisting teachers in grounding educational processes (including AIDS education) in local contexts. There are a number of applications of indigenous knowledge systems to AIDS education that are explicitly tied to indigenous environmental knowledge. For example, there is a growing body of indigenous knowledge regarding the utilisation of wild and traditional foods in rural food security (Shava, 2005; Mphale et al., 2002; Gari, 2003). This is especially important given the consideration mentioned in the preceding sections regarding AIDS and food security. Moreover, Mlipha (2004) has looked at AIDS through the lens of environmental education and indigenous concepts, which the author suggests could be used as a basis for building greater community engagement.

Perhaps the most important motivation for the inclusion of indigenous environmental knowledge into AIDS education is suggested by the work of McGarry (2007). McGarry asserts that through recognising the importance of indigenous knowledge systems, we can begin to recognise children as actors in the AIDS epidemic, and not just victims. McGarry argues that in rural areas, children are ignored as positive agents in ensuring food and livelihood security. Children contribute to household economy and resource collection activities. Girls' wood collection activities on average occurred 4 days per week, and boys on averaged hunted almost every weekend. These activities comprise a facet of indigenous knowledge that may be critical for increasing resilience to the impacts of AIDS through the promotion of locally contextualised resilience strategies and livelihood diversification.

Conclusion

Building environmental education into AIDS education is not just a case of finding a place for environmental education through its links with societal issues "everywhere and nowhere" (Rosenburg, 2004). Indeed, AIDS is considered one of the greatest threats to sustainable development, as it has been shown to impact negatively on poverty, food security and the environment. For environmental education, which in southern Africa is the vehicle for Education for Sustainable Development (ESD), AIDS cannot, and should not, be marginalised by environmental educators in their activities. Existing AIDS educational activities are seriously challenged by a lack of diversity, inadequate teacher and learner buy-in, and poor institutional support. Environmental education has a key part to play in broaching AIDS education through a range of subject areas that touch on many aspects of the development issues AIDS is threatening to undermine. This paper has looked at the applications of environmental education to the AIDS pandemic through the strengthening of food security, psycho-social support and indigenous knowledge through the environment. These applications are just a few inroads into a field that will hopefully continue to be developed in the future.

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12

The sustainable university as a system: The case of the University of Maribor

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Abstract

This paper deals with the university as an institution that responds to global problems, using creative, real-world problem solving, based on "learning by doing". Sustainability-oriented problem solving at the university requires new approaches, based on interconnection and collaboration within a system (university) and with other systems (municipality, enterprises). The University of Maribor has been used as a case study to explore management changes and curricula improvements based on the principles of communitarianism and improved ways of communication within the university.

Introduction

Sustainable development is an evolutionary process aimed at achieving a more sustainable global society and economy. It is emphasised within many international documents, including the United Nations Millennium Development Goals and the first volume of "Climate Change 2007" adopted by the Intergovernmental Panel on Climate Change (IPPC). On the other hand, education is a significant tool with a crucial role in any approach to a sustainable global society. Both concepts, sustainable development and education, were combined in the United Nations Decade of Education of Sustainable Development, providing new opportunities in education, research and the creation of sustainable institutions.

In Europe, concerns about sustainable development and education have been voiced by organisations such as European Union (EU) and European Commission (EC). Thus these topics are included in documents: "A Sustainable Europe for a Better World: A EU Strategy for Sustainable Development" (COM, 2001), "The Role of the universities in the Europe of knowledge" (COM, 2003a), "Investing in research: an action plan for Europe towards a global partnership for sustainable development" (COM, 2003b), "The Lisbon Strategy" (EC, 2004), "Mobilizing the brainpower of Europe: Enabling universities to make their full contribution to the Lisbon Strategy" (COM, 2005), "Delivering on the modernization agenda for universities: education, research and innovation" (COM, 2006), and so on. The purpose of these documents is to stress the crucial role that European universities have in the creation of knowledge and innovation and in providing excellence at a sustainable level. This includes companies, too, allowing them to be directly included in research and education activities, ensuring the creation of new jobs and approaching the goals of the Lisbon Strategy.

This paper introduces an improved definition of the Sustainable University. A university can only be sustainable when all its sub-systems (departments, students, employees, etc.) behave sustainably, which includes adopting a networking approach. This approach is based on the idea of communitarianism; therefore in future a shift from individualism to communitarianism is needed, in order to fulfil the requirements of sustainable development and global challenges. Activities at the University of Maribor are discussed, where the implementation of efficient institutional and organisational changes is forefront. Furthermore, the authors of this paper are trying to explore new ways of communication within the sustainable university.

A model of a sustainable university

Universities could be characterised as conservative and non-flexible organisations from several points of view: for instance, in organisation, governance and operating conditions. These factors have remained almost the same for centuries, but sustainable development has brought changes and new challenges. Universities hold a missing key to global sustainability – a locus for practical action (M'Gonigle & Starke, 2006). Previously, a university was an organisation producing knowledge and graduates, but now it is becoming an integral part of the environment where it is sited. This new role includes protection of regional habitats (natural ecosystems), use of reusable, recyclable materials and goods, energy efficiency and the use of renewable energy sources, proper waste management (waste separation at source), sustainability inclusion in the curricula, cooperation in the region (enterprises, community, etc.), sustainable transportation, equity, equality, consumption and behavioural changes etc. By facing these challenges, universities will assume responsibility for education and research based on sustainable development principles. Research and education for sustainability require studying the real world from the perspective of many different academic disciplines. Nurturing interdisciplinary and multidisciplinary thinking and learning should become the main guideline for institutions of higher education (Gończ et al. 2006). In order to meet the challenges of a modern society and the need for environmental protection, structural as well as communicative changes are required.

The concept of the sustainable university should comprise dimensions of sustainable development (environmental, economic and societal ones) and political will (top management commitment) to make changes, including structural ones, to achieve the objectives. Therefore, the sustainable university could be defined as: A higher education institution that addresses, involves and promotes, on a regional and a global level, the minimisation of negative environmental, economic, societal and health effects in the use of their resources in order to fulfill its main functions of teaching, research, outreach, partnership, and stewardship among others as a way to help society

make the transition to sustainable lifestyles.

From individualism to communitarianism
Sustainability problems, such as climate change, closely linked with diseases (malaria, asthma) and poverty, require societies to be global, and follow a joint trail of powerful research and development activities, sharing a common commitment on the part of various stakeholders, and their active participation. Definitions of problems and proposals for solving them are evident in many international and European conventions, documents, goals, etc., beginning with the famous Brundtland Report's "Our Common Future", where even the title proposes a global endeavour, calling on everyone to commit to a better way of living and protection of the environment for future generations. There are also other documents highlighting the collective will. There are illustrative examples from the European Council and European Commission documents, where one of the titles in the review of Sustainable Development Strategy is "Our commitment to sustainable development" (EC, 2006), or in the UN Millennium Development Goals (MDGs), where the UN Secretary General wrote: "We will have time to reach MDGs …We cannot win now …It takes time to train the teachers, nurses, engineers; to grow the small and large businesses able to create the jobs and income needed. So we must start now …"

The objective of these documents is a global partnership, bringing to the fore collaboration between different nations, stakeholders and individuals. All documents referring to sustainable development invoke the first person plural (we) or possessive pronoun (our). But although international and national conventions foster collaboration, individualistic and competitive behaviours have become characteristics of modern societies (Lozano, 2007).

Communitarianism and the sustainable university
The idea of communitarianism was developed in the 1980s in the United States, led by the theorist Amitai Etzioni. The leading idea was to overcome the concept of society as directed in different orientations with solidarity. The idea is based on an assurance of equal possibilities. The word "communitarianism" derives from the word "community", meaning a unified body of individuals, which has its origin in Latin communitas, referring either to an unstructured community in which people are equal, or to the very spirit of community.

Etzioni also emphasises values, those delivered from generation to generation that strengthen the continuity needed for approaching the issue of sustainable development. Communitarianism shifts the focus of interest away from the individual and towards communities and societies. The term positive rights is central to the idea of communitarianism. It embraces basic conditions such as free education, affordable housing, a safe and clean environment and social safety. These principles of positive rights could be connected to the principles of sustainable development.

Universities define and shape students, professors, assistants, researchers, administrators and others in a community. The idea of communitarianism could be linked with that of the sustainable university, especially in terms of structural changes, new relationships and communication as prerequisite factors in a changing world.

Communication within the sustainable university
Today universities continue to be organised into separate departments, reflecting their disciplines, each doing their own research, with limited communication between them (M'Gonigle & Starke, 2006). Therefore, communication at universities is mostly poor and chaotic, with little desire for networking opportunities. On the other hand, communication presents itself as a means for innovation and solving problems (Juholin, 2006) – it occurs at various levels of systems and their environments, enabling co-ordination of their activities (Juholin, 2006). Thus, sustainable universities require a different communication approach that ensures collaboration between system parts, and transformation from individualistic to community-type behaviour. This communication should not be hierarchical, but should rather be based on discussion, where the field of discussants is growing, with new communication rules, to a point where every stakeholder could get involved.

A case study: the University of Maribor
In the last 15 years, Slovenia has experienced drastic political and social changes. During this period it has changed politically from a self-governing, socialist Federal unit, to a democratic EU state, presenting minor differences from other Western countries in this present era of postmodernism. Lately, life in Slovenia has improved, but inequality between individuals is increasing, presenting a step away from the societal aspect of sustainable development which emphasises social equity, equality and environmental protection. Also, political changes have launched the rise of a free market economy, fostering the emergence of a modern Western-type individual, relentlessly competing for self-specific objectives.

Individualistic behaviour leading to egocentrism can be seen at the university, between students as well as academics. Illustrative examples emerge in students' project work, where students do not want to cooperate with each other, do not know how to work together in a team, etc. An even more difficult task is to persuade professors from various departments to work together. Therefore, at first sight, the establishment of a sustainable university seems a Utopia.

Communitarianism and collaboration at the University of Maribor
In May 2006, a Council for Sustainable Development (CSD) was established at the University of Maribor, including representatives from 9 out of 15 departments (Lukman & Glavič, 2006). These representatives were mostly professors working in the field of sustainable development. It seemed very difficult to achieve cooperation between professors and their departments. Professors are individualists and they are used to doing research alone. Professor Hughes,

the executive director of The Environment at Manchester (TEAM), described with figurative allegory the difficulties of collaboration at Manchester University: "Establishing collaboration between departments, professors is very difficult, because you cannot herd cats" (Colin Hughes, personal communication, 18/12/2006).

Communication between top management at the University of Maribor is mostly formal and used to serve specific tasks. It is a process of transmitting messages normally closed to the other university stakeholders. On the contrary, communication in the CSD is open, including other stakeholders. The representatives in the CSD expressed satisfaction about CSD and its non-hierarchical organisation.

At the beginning the interest in establishing a sustainable university in Maribor was very low. To motivate other stakeholders (enterprises, municipality, students, etc.) the CSD's main tasks were presented to a broader audience. A round-table "Environmental Protection and Sustainable Development" event was organised. The response was good. Around 40 people from the local community, enterprises, students and NGOs participated. The event was fruitful: participants presented their work in the sustainability field and highlighted the will to collaborate with the university CSD. A common university vision was presented as well, including all the stakeholders. The vision presents a first step to achieve the agreed goals in the community.

Curriculum changes

As a consequence of the Bologna Process, the University of Maribor has had to prepare renovated study programmes for Bachelor and Master studies. The first attempt to include environment and sustainable development in the curriculum, satisfying the Bologna requirements, was the establishment of a new Environmental Protection programme in the Faculty of Arts at the University of Maribor. The preliminary proposal of the programme, evaluated by the experts, gave disappointing results. This preliminary proposal was evaluated from four perspectives:
- Adequate titles of courses and their contents
- Similar topics in different courses
- Adequate literature related to the content of the courses
- Professors' research background in their field of teaching.

It was found that titles and contents of the courses were not adequate. For example, the course entitled Cooperation with the Public around Environmental Protection included topics such as teaching instruments, school in nature for the pupils, the educational role of the school in nature, etc. The topics missing were communication between different stakeholders, environmental NGOs, etc. Furthermore, the course Cleaner Production consisted of topics: bio-catalysis of water, industrial microbiology, biotechnology, membrane technique for water purification, etc. The course content was not in compliance with the definition of cleaner production.

The content of the courses was reviewed on the basis of two principles: common themes and keywords. It was found that 28 courses out of 68 had some topics in common with other courses. For example courses: Land Water and Limnology contained the themes: water cycles, global analysis of water, physical and chemical characteristics of fresh water, etc. Furthermore, Landscape Ecology had themes similar to Conservation of Habitats in Cultural Landscapes, e.g. changes of vegetation of cultural landscape, landscape dynamics, landscape heterogeneity, vegetation and habitat types in cultural landscapes, etc. Review of the keywords showed that, for example, the keyword waste was presented in titles of 6 courses, water in 7 courses, etc.

Another missing link was the one between the literature and content of the courses. For example, the course Environmental Education included only psychological literature.

Another analytic project reviewed professors' publications from 2000 to 2006: to ensure adequate quality of publications, only journals with an impact factor were taken into consideration. The analysis showed that more than 27 % of professors did not publish any scientific papers within these years. 19% of them published scientific papers in journals with an impact factor, but not in the teaching field proposed. For example, one professor published four papers related to polymer science and he was teaching the course Integrated Environmental Protection.

The problems resulting from the non-strategic preparation of the programme could be a consequence of the lack of communication between departments, professors and research groups. Another reason could be the difference in the attractiveness of various fields, which led to major internal conflicts (Gońzc et al., 2006) and not to cooperation.

The programme Environmental Protection has not been tackled systematically and has obvious imperfections in this preliminary phase. It is important to point out that at the University of Maribor a similar programme called Environmental Chemistry and Sustainable Development already exists for doctoral study in the Department of Chemistry and Chemical Engineering. Therefore, in the same department a project to develop bachelor and master studies has been proposed and is to be funded by the European Union and Slovenian Ministry of Higher Education, Science and Technology. The aim of this project is to develop Bachelors and Masters engineering modules, following the Bologna process. This project has been approached more systematically, based on collaboration between 4 European universities and 7 Slovenian enterprises, dealing with environmental protection, sustainable development, and cleaner production. It reflects collaboration between enterprises, municipality and the university to develop an up-to-date and attractive academic programme for the 21st century, filling the gap between what university professors teach for tomorrow and what tomorrow's graduates need from university today (M'Gonigle & Starke, 2006). The project is based on the main principles of developing new modules and programmes:
- Review of environmental engineering/technology

and chemical engineering/technology programmes at some of the best universities, according to the Top 500 University ranking (http://ed.sjtu.edu.cn/ranking.htm);
- Review of adequate textbooks, including their pedagogical-didactical evaluation;
- Review of research topics and trends of research and development in the field of environmental engineering and sustainable development, including climate change;
- Participation at international congresses and seminars;
- Evaluation of professors, based on papers published and number of citations;
- Results of the international Workshop "Higher Education and Sustainable Development" organised at the University of Maribor;
- Consultations with professors and specialists active in the field; comparison and review of their proposals for individual courses;
- Coordination of modules for the Environmental Engineering and Sustainable Development programme;
- Agreement about the criteria for quality assurance.

Results and discussion
The case study showed that there existed a need and willingness for collaboration between university, private enterprises and local community. Therefore, some projects and ideas will be realised as products of endeavours at the roundtable and collaboration with other universities and other stakeholders, viz.:
- Waste separation: public enterprise Surovina, dealing with waste recycling, will help the university with a waste management plan and prepare bins for separate waste collection.
- Municipality Programme for Environmental Protection in the city of Maribor: academics, students and community members will jointly prepare this Municipality Programme.
- Council for Sustainable Development at the University of Maribor: students and NGOs have committed to take a part in the establishment of a sustainable university.
- Curriculum: universities do not address sustainability issues in their curriculum enough; therefore, a general course on sustainable development should be organised, reaching not only students, but also community members. In this way, regional collaboration and cohesion could be strengthened.

Conclusions
Global problems require a common vision, coordination and collaboration between various stakeholders, based on communitarianism. This requires team work and cooperation. To transform a university into a sustainable one, a full commitment is needed from stakeholders such as academics, students, administrations, workers, and local authorities. There is also a need for the political will to make a change. A lack of communication and team work could lead to unsuccessful projects. Therefore, starting points are required for the designing of new models and programmes, based on continuous collaboration between project partners.

In this paper some ideas with which to approach the notion of a sustainable university were proposed, based on experiences at the University of Maribor. It may be concluded that success can only be achieved through mutual collaboration, by sharing experiences, using open communication, and new ways of communication (roundtables), which spontaneously enable innovations and problem solving in an informal way.

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