



# Education for Sustainable Development: Knowledge and environment in South African schooling

Moraig Isobel Peden, University of KwaZulu-Natal, South Africa

## *Abstract*

*The United Nations' launch of the Decade of Education for Sustainable Development in 2005 has focused international attention on the concept of education for sustainable development (ESD). This paper covers the emergence of ESD in relation to environmental education in South Africa. It critiques the core concept, sustainable development, and identifies a trend in ESD to de-value a knowledge base, particularly in relation to the natural environment. A sociology of knowledge perspective is used in conjunction with the writer's own experiences in environmental education. A critical/social realist approach is proposed as a way past the impasse of traditional education versus the progressivism of ESD. A disciplinary knowledge base is seen as foundational in teacher education and schooling in order to develop environmentally literate and responsible citizens. Strategies to achieve this include the introduction of a few selected environmental issues across the curriculum, making use of selected teachers rather than all teachers, and including core environmental literacy courses in teacher education.*

## *Introduction*

The United Nations Decade of Education for Sustainable Development (DESD), led by the United Nations Education, Scientific and Cultural Organisation (UNESCO), was launched in 2005 and encourages governments to implement education for sustainable development (ESD) in education systems and national development plans. The DESD aims to build the vision of sustainable development and promote the Millennium Development Goals. The four main target areas of the DESD are quality basic education, reorienting existing education, public awareness and training of both leaders and workers (UNESCO, 2005b).

South Africa is signatory to numerous international agreements on sustainable development and has a draft Framework for Action for the DESD (Olivier, pers. comm., June 2006). The current Minister of Education, Naledi Pandor, has committed her department to promoting the DESD and the principles of sustainable development in all levels of education (Segalwe, 2007).

The post-apartheid integrated curriculum has been described as radically constructivist (Taylor, 2000) and shows a strong affinity with ESD. It includes the principles of human rights, inclusivity, and environmental and social justice across all subjects, and does not address environment or sustainable development as subjects on their own.

This article explores the emergence of ESD from environmental education in South Africa and critiques it from a sociology of knowledge perspective. The critique is influenced by my own

disciplinary background in both natural science and development, upon which I draw substantially in my environmental education work with teachers at the University of KwaZulu-Natal.

I argue for a social realist approach as a way past the impasse of traditional education versus the progressivism of ESD. I propose a re-recognition of disciplinary knowledge in both natural and social sciences as a foundation for meaningful engagement with environmental issues.

### *The Problem of Sustainable Development*

The concept of sustainable development emerged in 1987 from the UN World Commission on Environment and Development report, *Our Common Future*, produced in the wake of the UN Conference on the Human Environment in Stockholm in 1972. 'Sustainable development' entered global parlance after the 1992 UN Earth Summit (UNESCO, 2005b) as a way of linking human development needs to environmental issues (Le Roux, 2000).

Broadly, it includes the three pillars of development: environment, economy and society. However, by 1996 there were more than 300 published definitions of the concept (UNEP, 2006) and a crucial contradiction remains: the economic growth model of development and environmental health stand in fundamental opposition (Rees in Stevenson, 2006; De Gruchy, 2001) and insufficient global resources will prevent developing economies from following the same path as industrialised nations (Webster, 2004). While politicians have espoused sustainable development for 20 years, development paths have become less and less sustainable. The Millennium Ecosystem Assessment (2005), an extensive five-year international research report, reveals rapid ecosystem changes in ecosystems over the past 50 years with high extinction rates and severe pressure on ecosystem services such as fishing and fresh water supplies.

The natural environment has become increasingly remote in industrialised society, the concept of ecological limits is foreign (Scott in Stevenson, 2006) and danger signals are commonly misunderstood or disregarded (Smyth, 2006). But the poor often depend directly on natural ecosystems and there is a clear link between ecosystem health and human well-being (UNEP, 2006). In pre-industrial society, knowledge of natural resource use was an integral part of education and essential for survival.

For Robottom (2007:7) the concept of sustainable development does not challenge established practice but instead suggests 'a continuation of what we value'. This view is echoed by Bolscho and Hauenschild (2006) who claim that environmental educators face opposition if they question the basic values of modern life; a tension that often leads to them merely verbalising problems or organising token environmental actions.

As sustainable development is taken up at political levels, the environment often falls out of the picture altogether. The concept is open to numerous interpretations and is largely dominated by a focus on economic rather than environmental sustainability (Robottom, 2007).

### *Education for Sustainable Development*

While there are concerns that ESD is new in name only (Robottom, 2007), others argue that it represents a shift in emphasis away from the natural environment and onto the social, political

and economic environment (Stevenson, 2006). Reid and Scott (2006) describe the tension between environmental education and ESD as primarily a tension between social justice and environmental protection. However, the social facets of environmental education are not new and can be traced back to UNESCO documents and the Belgrade and Tbilisi reports on environmental education in the 1970s (Robottom, 2007; Stevenson, 2006).

In South Africa, the launch of the DESD in 2005 was preceded by a long history of environmental education. Prior to 1994, environmental education was largely the domain of environmental NGOs and universities, but since then the environment has been included in the formal school curriculum both in principle and as a theme to be included in all subjects.

In the 1990s environmental education shifted strongly into the socio-economic and political arenas (Le Roux, 2000), looking very similar to ESD with university courses and programmes adopting progressive, constructivist approaches and concentrating on the links between environmental and social issues (UNEP, 2006; Le Roux, 2000). Concerns did, however, emerge amongst some educators that a predominantly social emphasis was leading to the exclusion of the natural environment (Rosenberg, 2004).

The goals of ESD are intentionally unspecific. Broadly it aims to create responsible, environmentally literate and critically thinking citizens able to address environment and development issues as a matter of conflicting interests and different perspectives (UNEP, 2006; Sandell, Ohman & Ostman, 2005), but it avoids the use of clear, unambiguous educational goals (Sandell *et al.*, 2005). The pedagogy of ESD encompasses progressive constructivist education approaches: critical thinking, participation, contextualised learning, use of local materials, problem-solving, community engagement, action-oriented, socially critical and student-led (Sandell *et al.*, 2005; UNEP, 2006; UNESCO, 2005c).

Within ESD there is a reluctance to identify a knowledge base. Existing knowledge is described as 'static' and rejected in favour of adaptive forms of knowledge, which are intended to prepare learners to cope responsibly and democratically with a rapidly changing society and create new space for alternative living (Sandell *et al.*, 2005, UNESCO, 2001, Wals & Corcoran, 2006). Anything else is seen as unacceptably undemocratic.

### *The Question of Knowledge*

The question of knowledge lies at the heart of current debate in South African education. Muller (2004:17) identifies the current educational trend of avoiding knowledge structure and in-depth immersion in disciplines as lying at 'the nub of ... current pedagogical dilemmas'. This has implications for ESD.

In the following section, I describe two distinct approaches to knowledge. I then look at how this might guide ESD and environmental education.

The discipline-bound approach to knowledge encompasses Durkheim's sacred knowledge, Vygotsky's scientific knowledge, Bernstein's (1999) vertical knowledge and Muller's (2000) Mode 1 or insular knowledge, and forms the basis of traditional approaches to education. Durkheim's sacred knowledge is collective knowledge which the individual has little choice in accepting, and thus functions to maintain social solidarity. It parallels the model of abstract,

modern science and highlights the social origins of abstract thinking (Young, 2008). Key to Vygotsky's scientific knowledge is reflexivity, which is only acquired through mediation (e.g. schooling). Bernstein's (1999) concept of vertical knowledge, heavily based on physics, identifies the hierarchical, coherent, explicit structure of the sciences; while Muller's Mode 1 knowledge is characterised as academic, inward-looking and transmission-oriented.

Discipline knowledge emanates from the collective practice of theory and reflection within a scientific community, giving it the power to transcend its original context in society and history (Moore, 2004; Niinitluoto, 2000; Young 2008). Spurrett's (2008:8) argument in favour of discipline knowledge suggests that because 'the actual universe is deeply alien to our default conception of the world' we need scientific knowledge, which is often counter-intuitive and depends on the social structures of disciplines for its production. To gain such knowledge one must be inducted into the practices of a discipline (Dempster, 2005), a process which results in specialists being able to work with high levels of complexity (Spurrett, 2008).

Traditional education based on discipline knowledge is often criticised for its tendency to rely on a 'given' curriculum. It has been labelled slow, inefficient, elitist (due to inequalities of access) and out of touch with global society (Young, 2008).

A second, distinct category of knowledge is everyday knowledge or common sense; which encompasses Durkheim's profane and Bernstein's (1999) horizontal knowledge and focuses on the practical and immediate with an inability to move beyond the local context. Vygotsky characterises common sense as emerging through face-to-face contact with life, lacking a system of concepts and with no capacity for generalisation and abstraction (Young 2008). Muller (2000) extends this definition to Mode 2 knowledge, which is applied, collaborative, outward-looking, socially accountable, innovative and emancipatory – i.e. knowledge which engages with the problems of the world.

The flaws of traditional education have increasingly led policy-makers to favour constructivist, progressive curricula on the grounds that it is emancipatory and allows for greater participation of learners in society. Such curricula emphasise everyday, integrated knowledge as a way of bridging learners' own cultural knowledge with discipline knowledge (Young, 2008). This shift is reflected in the outcomes-based education which followed the South African apartheid curriculum as well as constructivist approaches in environmental education and ESD.

Young (2008) raises concerns that constructivist critiques of discipline knowledge are polarising, unable to recognise truths in other positions and misrepresent discipline knowledge as monolithic rather than contested, while offering no alternative theories of knowledge. Constructivists diminish discipline knowledge by giving it the same weight as everyday, localised knowledge; and view it suspiciously as a disguise for individual vested interests (Moore, 2004; Niinitluoto, 2000). The argument around 'interests' is a circular one, and revolves around whose experience should underpin the curriculum. It ignores the possibility of pedagogic or cognitive interests (as opposed to money, status and power) and reduces knowledge to the views and experiences of the knowers. This limits its ability to transcend experience and leads to curricula only offering different forms of localism. Oppressed communities are therefore denied knowledge that goes beyond their own experience (Young, 2008).

While the use of everyday knowledge appears to converge with the policy goals of social equity, Young (2008) argues that it is promoted on socio-political rather than pedagogical or epistemological grounds. Its value in achieving social change is controversial. Bernstein's (1971) observation that everyday knowledge leads to inferior education relegated to less able children who struggle with abstraction is borne out by recent research which shows middle-class learners move relatively easily between everyday knowledge and abstract concepts, while working-class learners need explicit guidance to move beyond the local and specific (Hoadley, 2005; Hugo, 2005). Taylor and Vinjevd's (1999) classroom observations indicate that an absence of content knowledge leaves learners bewildered and unlikely to develop a systematic understanding of ideas.

The pursuit of new knowledge is an important goal of ESD (Sandell *et al.*, 2005; UNESCO, 2001; Wals & Corcoran, 2006). Proponents argue that this should be achieved through discipline integration as a necessary step for addressing complex sustainability issues such as climate change and HIV/AIDS (UNESCO, 2005a). The ultimate goal is trans-disciplinarity, where new theoretical understandings are generated (UNEP, 2006). Bernstein's (1971:10, 1999) argument that deep knowledge is acquired through a traditional discipline-bound approach to education and only reveals its mysteries to a select few may seem unacceptably elitist within ESD. But his proposal that it is only through deep, abstracted knowledge freed from particular contexts that new realities are discovered suggests a permeable form of knowledge which is crucial to the vision of ESD. He states: '... only a few experience in their bones the notion that knowledge is permeable, that its orderings are provisional, that the dialectic of knowledge is closure and openness.'

Integration was a dominant principle in South Africa's first post-apartheid curriculum, but by 2000 the Review Committee of Curriculum 2005 found that it weakened conceptual progression and coherence (DoE, 2000). Mounting evidence shows that the dissolution of discipline boundaries can disadvantage learners (especially those from poor backgrounds) by denying them access to powerful knowledge systems (Dempster, 2005; Dowling, 1995; Hugo, 2005; Muller, 2004; Taylor, Muller & Vinjevd, 2003).

Integration does not treat all disciplines equally. ESD, like the South African curriculum, places greater emphasis on social sciences than natural sciences. Dempster (2005) raises concerns that the emphasis on social justice within Life Sciences undermines the essential concepts of the subject.

### *The Natural Environment*

ESD de-emphasises the natural environment. A UNESCO (2001) document states that ESD should not be confused with environmental education and it is not primarily concerned with the environment. This is echoed in a UNESCO (2005c) document on teacher education for sustainability. While the UNESCO International Implementation Scheme proposes that ESD should 'encompass and go beyond environmental education' (Calder, 2005:5), Webster (2004:82) claims: 'Science-based teaching about Nature and how we should protect it, is not, by itself anything to do with ESD.' In Sandell *et al.*'s (2005) book on ESD, it is characterised

with no mention of the natural environment. The environment is overshadowed by socio-economic foci and it is debatable whether ESD will challenge the industrial/technological and anthropocentric worldview that is described by Orr (in Stevenson, 2006) as part of the hidden curriculum of schooling lying at the heart of environmental degradation.

Diminishing knowledge in the field of natural sciences is a concern for some environmental educators and scientists who fear that the shift away from the natural sciences inevitably leads to a shallow understanding of environmental issues. As Louv (2005:142) argues: 'The people who name the animals, or even know the names, are fast becoming extinct.' Eminent oceanographer, Paul Dayton (in Louv, 2005) links the environmental crisis to virtual disappearance of natural sciences in academia. On the other side of the debate, Barraza and Robottom (2005) raise concerns that natural scientists, lacking social science knowledge, are inadequately prepared to address environmental issues. Robottom (1991, 2005) argues that 'information critique' is more important than the acquisition of knowledge, and that 'blind faith' in science is inadequate for environmental educators. In this paper I shift the emphasis by proposing that social science alone is inadequate for addressing environmental issues and that deep knowledge from both natural and social sciences is a prerequisite for critical thinking. Without an understanding of the science of key environmental issues, one is doomed to superficial and inappropriate responses.

Empirical research in the UK on teachers and trainee teachers shows weak knowledge of the carbon cycle, solar energy and ozone (Summers, Kruger & Childs, 2001). Rosenberg (2004) also observes weak natural science knowledge of teachers in South Africa schools, leading to the exclusion of the natural environment from environmental education. My teaching experiences at the University of KwaZulu-Natal, suggest that students enrolled in environmental education courses have superficial knowledge of environmental issues such as global warming, air pollution and the ozone layer. (Peden 2004; Peden, 2005; Peden, 2006a; Peden, 2006b; Peden, 2007a; Peden, 2007b). Evidence from student research projects conducted in schools in Pietermaritzburg, South Africa, indicates that although environment is supposed to cut across the entire curriculum, it is rarely addressed by teachers other than those in Geography and Natural Science (Peden, 2006b). Within these disciplines there is a narrow scientific focus with little attention to the interface between the natural and social sciences.

### *A Way Forward: Social/Critical Realism*

Young (2008) and Moore's (2004) arguments for social and critical realism offer a way past the polarisation between traditional and constructivist approaches.

Critical realism (Moore, 2004) – or an associated body of work termed social realism (Young, 2008) – accepts the existence of a reality independent of individual perspectives, but acknowledges that knowledge is socially created, a process that forms the basis for objectivity rather than a condition which makes objectivity impossible. This argument claims that by being less individualistic, disciplinary knowledge is less fallible than other forms of knowledge. Young's (2008) social realism marries Durkheim's social reality of knowledge (the curriculum) with

Vygotsky's process for transforming the world using both disciplinary and everyday knowledge (the pedagogy).

Social realism proposes a knowledge-based model of curriculum where knowledge is external to the learners, with clear boundaries between discipline knowledge and everyday knowledge. This curriculum uses knowledge to overcome the circumstances in which people find themselves (Young, 2008), by shifting away from both Bernstein's a-historical 'given' curricula as well as from constructivist reliance on learner-centredness, relevance and experience. Curriculum autonomy is separated from economic and political demands and increased participation is balanced with cognitive interests; the aim being to build specialist communities rather than achieve learning outcomes. This approach is a midway position that does not reject valuable discipline knowledge, but rather views the conscious selection and use of such knowledge as an essential basis for applied, emancipatory and collaborative work in the world.

Unlike Durkheim, Vygotsky views the two types of knowledge as distinct but interdependent categories with potential for learners to move from concrete perceptions to generalisations and abstractions. Muller (2000) also proposes a relational approach between the two forms of knowledge. Mode 2 knowledge (applied, collaborative, outward-looking, socially accountable, innovative and emancipatory) appears to be a key characteristic of ESD, but Muller (2000) and Young (2008) argue that the way to get there is by building on the foundations of Mode 1 (disciplinary) knowledge, particularly at undergraduate level, in order to develop critical thinking abilities. Both Muller (2000) and Spurrett (2008) emphasise the importance of differentiating between the two types of knowledge, and recognising when one crosses the boundaries between disciplines, rather than trying to hybridise them.

Muller (2000) argues that effective Mode 2 knowledge is generated through the collaboration of researchers from different disciplines, leading to results not achievable by individual experts. Higher-order reconfiguring skills, an ability to work with complex models and to generalise skills to analogous situations, requires the development of skills in specific discourses first. 'Active learning ... begins with disciplines, not with whimsical activities detached from core subject matter concepts' (Darling-Hammond in Muller 2000:52).

Bernstein's (1971) proposals for successful inter-disciplinary learning – which include consensus around an explicit integrating idea (e.g. sustainable development) and skilled teachers who enjoy ambiguity and can link the integrating idea to the knowledge base – may have useful implications for ESD.

### *Social Realism and ESD/Environmental Education in South Africa*

Muller (2004) identifies teacher competence as the most important factor in education and argues for solid disciplinary training of teachers. Ideally those who teach ESD should be selected from graduates in natural sciences (e.g. biology and earth sciences) as well as social sciences (which may include human geography, environmental history and environmental sociology), rather than expecting all teachers to do ESD or environmental education.

While environment is not a school subject in the South African curriculum, the opportunity does exist to include dedicated environmental courses in teacher education programmes. As many student teachers, both post- and undergraduate, have poor environmental literacy (Peden 2004; Peden, 2005; Peden, 2006a; Peden, 2006b), it makes sense to develop core environmental knowledge through environmental literacy courses before undertaking environmental education, where the focus is on pedagogy at the expense of discipline knowledge (Peden 2006b; Peden, 2007b).

If environmental education starts early in teacher education, it allows interested students to pursue it further. Final-year education students at the University of KwaZulu-Natal indicated that a compulsory course in environmental education<sup>1</sup> (Peden, 2007) was an eye-opener and something they had not previously thought about. This is illustrated by their comments:

*'I need to find ways to bring awareness to others as this is an almost forgotten territory of learning.'  
'I have learnt that it is not only the government who has to look after the environment.'  
'Some of us had no idea or were not realising how important the environment is to people.'  
'Recycling and environment conservation is the simplest thing someone can do, but people tend to ignore it. It affects the globe as a whole. People should take heed of it.'*

Environmental education is a cross-curricula principle, an approach favoured by ESD (Smyth, 2006). Concerns about this approach are the tendency for environment to fall off the curriculum, as it is not the primary focus of any teacher (Rosenberg, 2004), as well as issues of over-simplification resulting from educators trying to cope with complexity in environmental issues (Smyth in Stevenson, 2006).

Effective ESD may be achieved by selecting relatively few in-depth studies of environmental issues and choosing local issues that connect to student's lives (Stevenson, 2006). Teachers could explore the root causes and effects of environmental issues from the perspective of their own disciplines, and then move on to generate analogies between global issues and local contexts.

Using Bernstein's (1971) criteria for successful integrated teaching, and by way of example, I have selected global warming as an explicit integrating idea which can be linked by skilled teachers to their own discipline in order to teach environment meaningfully across the curriculum.

Natural Science teachers could link global warming to ecology and environmental degradation; Geography teachers to natural cycles, climate patterns and development; History teachers to the industrial revolution, capitalism and globalisation; Religious Studies and Life Orientation teachers to ethics, values and citizenship; and Technology teachers to energy technologies. Hugo (2005) argues additionally for the support of sequenced, content-rich textbooks which can induct learners into discipline knowledge through clear, explicit rules. The aim here is to use disciplinary knowledge to take students beyond their own limited experience in order to imagine new solutions and new possibilities. When learners have acquired discipline knowledge of the environment they will be more able to become critical thinkers and engage in contextualised, socially critical learning and problem-solving, as proposed by ESD.



## *Conclusion*

ESD claims to offer something new for education internationally. It focuses on teaching learners to engage democratically with different perspectives; and consciously lacks definition around its core concept – sustainable development – and its knowledge base. It promotes progressive constructivist pedagogy, integration of disciplines and everyday knowledge over disciplinary knowledge. This pedagogical approach, which also underlies the South African National Curriculum Statement, is currently being challenged for not meeting the educational goals of social justice and denying learners access to powerful knowledge systems.

Additionally, ESD continues a trend in environmental education of de-emphasising the natural environment in favour of social issues. These trends have resulted in the diminished nature-based views of environmental education in South African schooling.

This paper argues for a critical or social realist approach as a way around the impasse of traditional positivist education versus progressive constructive education. From this position, disciplinary knowledge of both natural and social sciences is an essential foundation for further engagement with the applied, collaborative nature of environmental education.

Failing the introduction of environmental studies as a school subject, this paper proposes strengthening school environmental education by selecting a few environmental topics to be addressed in depth in selected school subjects. Currently the Curriculum Statements at General Education and Training (GET) level (compulsory learning areas from grades R to 9) lack a specific and coherent focus on key environmental issues of the 21st century; such as global warming, climate change, habitat destruction and extinction, and the proximate causes such as consumption and population growth. While aspects of these topics are included in learning areas such as Natural Science and Geography, they are not addressed in a coherent, structured and critical manner. An explicit environmental focus within disciplines could be a starting point for powerful, integrated knowledge where both teachers and learners deepen their understanding of the topic.

This paper supports attempts to build disciplinary knowledge of the environment by introducing core environmental literacy courses early on in teacher education programmes, so that environmental knowledge informs the pedagogy of teachers.

ESD owes much to its mother concept, sustainable development, which has been described as allowing ‘people with widely different views to accept it to some degree, but without agreeing on any of the underlying philosophical and political issues’ (Stevenson, 2006:278). This paper recognises that ESD is a political initiative; designed by policy-makers to gain wider support than environmental education has ever achieved. It has made its way into international agreements, national policies and education agendas. However, the gap between ‘policy sloganising and policy implementation is very great’ (Stables & Scott in Stevenson, 2006:287). The challenge for educators is to use ESD to open doors, but not to lose their way once they are in. The challenge is to re-embrace a foundation of deep disciplinary knowledge which goes beyond personal experience; for educators from different school disciplines to celebrate their specialisations and use them to create meaningful environmental education where learners

armed with knowledge are motivated to work creatively in the interface between human society and the natural environment.

### *Notes on the Contributor*

Moraig Peden is a lecturer in Environmental Education, Agricultural Education and Development Education at the University of KwaZulu-Natal. Email: pedenm@ukzn.ac.za

### *Endnote*

1. In 2007, 60% of the 33 students enrolled in the compulsory environmental education module for final-year Bachelor of Education students felt that the module had an important role in creating awareness of the importance of environment in their teaching.

### *References*

- Barraza, L. & Robottom, I. (2005). From ecological science to environmental education: A professional turning point? *Themes in Education*, 6(2), 131-141.
- Bernstein, B. (1971). On the classification and framing of educational knowledge. In Young, M.F.D. (Ed.), *Knowledge and control: New directions for the sociology of education*. London: Collier-MacMillan.
- Bernstein, B. (1999). Vertical and horizontal discourse: An essay. *British Journal of Sociology of Education*, 20(2), 158-173.
- Bolscho, D. & Hauenschild, K. (2006). From environmental education to education for sustainable development in Germany. *Environmental Education Research*, 12(1), 7-18.
- Calder, W. (2005). The UN Decade of Education for Sustainable Development – a progress report. *The Declaration*, 7(2), 1-8.
- De Gruchy, S. (2001). Introducing the United Nations Millenium Declaration. *Journal of Theology for Southern Africa*, 110, 57-76.
- Dempster, E. (2005). The democratisation of knowledge: where have all the experts gone? Review of *The architect and the scaffold: evolution and education in South Africa*. *Journal of Education*, 36, 111-115.
- (DoE) Department of Education (2000). *A South African curriculum for the twenty-first century: Report of the Review Committee on Curriculum 2005*. Pretoria: Department of Education.
- Dowling, P. (1995). Discipline and mathematise: the myth of relevance in education. *Perspectives in Education*, 16(2), 209-226.
- Hoadley, U. (2005). Social class, pedagogy and the specialisation of voice in four SA primary schools. Unpublished PhD thesis, University of Cape Town, Cape Town.
- Hugo, W. (2005). New conservative or new radical: The case of Johan Muller. *Journal of Education*, 36, 19-36.
- Le Roux, K. (2000). *Environmental education processes: Active learning in schools*. Pietermaritzburg: University of Natal Press.

- Louv, R. (2005). *Last child in the woods: Saving our children from nature-deficit disorder*. Chapel Hill: Alonquin Books of Chapel Hill.
- Millenium Ecosystem Assessment (2005). *Ecosystems and human well-being: Synthesis*. Washington, D.C.: Island Press. <http://www.millenumassessment.org>, visited October 2008.
- Moore, R. (2004). *Education and society: Issues and explanations in the Sociology of Education*. Cambridge: Polity Press.
- Muller, J. (2000). *Reclaiming knowledge: Social theory, curriculum and education policy*. London: Routledge Falmer.
- Muller, J. (2004). *On the shoulders of giants: A digression on knowledge, curriculum, and finally, the teacher*. Paper presented at the Third Basil Bernstein Symposium, University of Cambridge, United Kingdom.
- Niiniluoto, I. (2000). *Critical scientific realism*. Oxford: Oxford University Press
- Orr, D. (1994). *Earth in mind: on education, environment and the human prospect*. Washington D.C.: Island Press.
- Peden, M. (2004). Cross-curricular studies 2004: Internal examiner's report: Environmental Education. University of KwaZulu-Natal, Pietermaritzburg.
- Peden, M. (2005). Cross-curricular studies 2005: Internal examiner's report: Environmental Education component. University of KwaZulu-Natal, Pietermaritzburg.
- Peden, M. (2006a). Environmental education (BEd Hons): Moderator's report. University of KwaZulu-Natal: Pietermaritzburg.
- Peden, M. (2006b). Cross-curricular studies 2006: Internal examiner's report: Environmental Education component. University of KwaZulu-Natal, Pietermaritzburg.
- Peden, M. (2007a). Cross-curricular studies 2007: Internal examiner's report: Environmental Education component. University of KwaZulu-Natal, Pietermaritzburg.
- Peden, M. (2007b). *Report on the Environment and Sustainability in Schools Module offered by University of KwaZulu-Natal and Wildlife and Environment Society of South Africa*. University of KwaZulu-Natal, Pietermaritzburg.
- Reid, A. & Scott, W. (2006). Researching education and the environment: an introduction. *Environmental Education Research*, 12(3&4), 239-246.
- Robottom, I. (1991). Technocratic environmental education: A critique and some alternatives. *Journal of Experiential Education*, 14(1), 20-26.
- Robottom, I. (2005). Two paradigms of professional development in environmental education. *The Environmentalist*, 7(4), 291-298.
- Robottom, I. (2007). Re-badged environmental education: Is ESD more than just a slogan? Paper presented at World Environmental Education Congress held at the International Convention Centre, Durban, South Africa.
- Rosenberg, E. (2004). Environmental education: Everywhere and nowhere? *Environmental Education Bulletin*, 26, 12-14.
- Sandell, K., Ohman, J. & Ostman, L. (2005). *Education for sustainable development*. Lund, Sweden: Studentlitteratur.
- Segalwe, O. (2007). South Africa: Environmental literacy is a key concern – Pandor. <http://www.allafrica.com/stories/200704270202.html>, visited 2 May 2007.

- Smyth, J.C. (2006). Environment and education: a view of a changing scene. *Environmental Education Research*, 12(1), 247-264.
- Spurrett, D. (2008). Philosophy enough. Inaugural lecture presented at the University of KwaZulu-Natal, Durban, 2 April 2008.
- Stevenson, R.B. (2006). Tensions and transitions in policy discourse: recontextualising a decontextualised Environmental Education/ESD debate. *Environmental Education Research*, 12(1), 277-290.
- Summers, M. Kruger, C. & Childs, A. (2001). Understanding the science of environmental issues: Development of a subject knowledge guide for primary teacher education. *International Journal of Science Education*, 23(1), 33-53.
- Taylor, N. (2000). Anything but knowledge: The case of the undisciplined curriculum. Paper presented at the Designing Education for the Learning Society Conference, Netherlands.
- Taylor, N., Muller, J. & Vinjevd, P. (2003). *Getting schools working*. Cape Town: Pearson Education South Africa.
- Taylor, N. & Vinjevd, P. (1999). *Getting learning right*. Johannesburg: Joint Education Trust.
- UNEP (United Nations Environment Programme) (2006). *Education for sustainable development innovations: Programmes for universities in Africa*. Howick: Share-Net.
- UNESCO (2001). *Education and public awareness for sustainable development*. Paris: UNESCO.
- UNESCO (2005a). United Nations Decade on Education for Sustainable Development, Annex 1. Draft consolidated international implementation scheme. <http://www.unesco.org/education/desd>, visited October 2008.
- UNESCO (2005b). *Report by the Director-General on the United Nations Decade of Education for Sustainable Development: international implementation scheme and UNESCO's contribution to the implementation of the Decade*. Paris: UNESCO.
- UNESCO (2005c). *Guidelines and recommendations for reorienting teacher education to address sustainability*. Education for Sustainable Development in Action, Technical Paper No. 2-2005. Paris: UNESCO.
- Wals, A. & Blaze Corcoran, P. (2006). *Sustainability as a catalyst and outcomes of transformative learning* (draft paper). Forthcoming in a UNESCO publication.
- Webster, K. (2004). *Rethink, refuse, reduce: Education for sustainability in a changing world*. Shrewsbury: Field Studies Council.
- Young, M. (2008). *Bringing knowledge back in: from social constructivism to social realism in the sociology of education*. London: Routledge.

### ***Personal Communication***

- Olivier, C. (2006) Chief Technical Advisor of the National Environmental Education Programme (General Education and Training), Department of Education, Pretoria, 22 June 2006.