



## Environmental Education and Science Education: Ideology, Hegemony, Traditional Knowledge, and Alignment

### Educação Ambiental e Educação em Ciências: Ideologia, Hegemonia, Conhecimento Tradicional e Alinhamento

**Erminia Pedretti**

OISE, University of Toronto  
erminia.pedretti@utoronto.ca

#### *Abstract*

Environmental degradation and decreasing quality of life have galvanized a generation and launched a resurgence of attention to environmental matters, raising questions about environmental education policies and practices, and their relationship to science and social responsibility. Accordingly, many programs, policies, and frameworks have emerged worldwide in an effort to understand, develop and implement environmental education. However, amidst shared concern for the environment and the recognition of the central role of education in enhancing human-environment relationships, there exist widely differing discourses and practices under the banner of environmental education (SAUVÉ, 2005). In this paper I examine environmental education in relation to: 1) the range of ideological orientations, 2) the hegemony of school-based disciplines, 3) traditional ecological knowledge and wisdom (TEKW), and 4) alignment with science education. This paper stems from my interest in understanding the location (both theoretically and pragmatically) of environmental education discourses in contemporary schooling.

**Keywords:** environmental education; science education tensions; theory and practice.

#### *Resumo*

A degradação ambiental e a diminuição da qualidade de vida incitaram uma geração, permitindo a volta da atenção às questões ambientais, o levantamento de questões sobre políticas e práticas de educação ambiental e suas relações com a ciência e a responsabilidade social. Assim, muitos programas, políticas e modelos surgiram em todo o mundo num esforço para entender, desenvolver e implementar a educação ambiental. No entanto, em meio às preocupações compartilhadas com o ambiente e

ao reconhecimento do papel central da educação na melhoria das relações homem-ambiente, existem discursos e práticas muito diferentes sob a bandeira da educação ambiental (SAUVÉ, 2005). Neste trabalho examino a educação ambiental em relação a: 1) gama de orientações ideológicas, 2) hegemonia das disciplinas escolares, 3) o conhecimento ecológico tradicional e a sabedoria (TEKW) e 4) o alinhamento com educação em ciências. Este trabalho é resultado do meu interesse em compreender a posição (teórica e pragmaticamente) dos discursos de educação ambiental no ensino contemporâneo.

**Palavras-chave:** educação ambiental; educação em ciências, tensões; teoria e prática.

## Introduction

We live in a time of rapid environmental change. Many would argue that our environment is in crisis: rainforest depletion, water management, desertification, and loss of biodiversity are but a few examples of the issues that require humankind's immediate response. Environmental degradation and decreasing quality of life have galvanized a generation and launched a resurgence of attention to environmental matters, raising questions about environmental education policies and practices, and their relationship to science and social responsibility.

It is generally agreed upon that UNESCO/UNEP produced the first inter-governmental statement on environmental education at Belgrade in 1975 (PALMER, 1998). The brief but comprehensive set of objectives (UNESCO, 1975) are summarized as follows: a) to foster clear awareness of and concern about economic, social, political, and ecological inter-dependence in urban and rural areas; b) to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment; and c) to create new patterns of behaviour of individuals, groups, and society as a whole towards the environment. The Belgrade Charter was ratified in 1977 as the Tbilisi Declaration (UNESCO/UNEP, 1978) and laid the foundation for subsequent work in environmental education. The charter (UNESCO/UNEP, 1978, p.24) also suggested that threats to the environment could be addressed through scientific research and advances in technology: "Education utilising the findings of science and technology should play a leading role in creating awareness and a better understanding of environmental problems." Here we begin to see the coupling of environmental and science education. In 1987 a report was published, entitled *Our Common Future* more commonly known as the Brundtland Report (WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT, WCED, 1987). The idea of sustainable development was introduced and defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987: 54). The Earth Summit, held in Rio de Janeiro (1992), resulted in Agenda 21, which served as an action program for nations to achieve sustainable development. More recently, the United Nations (UNESCO, 2005) declared 2005-2014 as *The Decade of Education for Sustainable Development*.

Such charters and reports reflect a collective desire to respect human rights; a commitment to social and economic justice for all; an obligation to intergenerational responsibility, protection and restoration of life in all its diversity; and a commitment

to build a culture of tolerance and peace, both locally and globally. Accordingly, many programs, policies, and frameworks have emerged worldwide in an effort to understand, develop and implement environmental education. However, amidst shared concern for the environment and the recognition of the central role of education in enhancing human-environment relationships, there exist widely differing discourses and practices under the banner of environmental education (EE) (SAUVÉ, 2005). In this paper I examine environmental education in relation to: 1) the range of ideological orientations, 2) the hegemony of school-based disciplines, and 3) traditional ecological knowledge and wisdom (TEKW), 4) alignment with science education).

## Environmental Education: Ideological Conflicts

Over time, the nature of environmental education (EE), and the language used to describe its goals and purposes have evolved. School based environmental education consists of a diversity of narratives (RUSSELL; BELL; FAWCETT, 2000) that are simultaneously a strength and a challenge. Some of these narratives are deeply embedded within science education, while others reach across different curriculum areas. Unraveling and critiquing these orientations in order to position environmental education in more productive ways is an important first step. Consider the following questions: Is environmental education about developing in students an ethic of care and stewardship? Is it important that students are immersed in the outdoors and experience the natural world? Should students be encouraged to engage in community based inquiry projects such as examining water quality of a local stream, or organizing a clean up of polluted waters? These questions reflect different EE orientations, and dimensions of our relationship to the environment. Furthermore, our responses to these questions affect teacher praxis, and the experiences we create for students.

In 2005, Lucie Sauvé published an article mapping the diverse narratives of environmental education. She employed the metaphor of *currents* to describe 15 different orientations to environmental education: *naturalist, conservationist/resource, problem-solving, systemic, scientific, humanist/mesological, value-centred, holistic, bioregionalist, praxic, socially critical, feminist, ethnographic, eco-education, and sustainable development/sustainability*. Each current conveys a particular conception of the environment and education, and suggests specific activities or pedagogical models. For example, the naturalist current is focused on human relationships with nature and recognizes the intrinsic value of nature beyond the resources it provides. Pedagogical approaches, according to Sauvé (2005) may be cognitive (learning about nature), experiential (being in nature), affective, spiritual or artistic. A socially critical current interrogates social realities underpinning environmental problems, and includes analyses of power relations, intentions, explicit and implicit values, and decisions and actions of various players and stakeholders. The currents are not mutually exclusive; often times they work in synergy and/or overlap with one another. Sauvé's (2005, p.11) intention in mapping the environmental education terrain was to:

*[...] bring to light and celebrate the richness of the environmental education field, thereby paying homage to the pedagogical creativity of its architects over the course of the last thirty years, as well as to their contribution in reflecting on the meaning, problems and possibilities of our relationship to the environment, and on the role of education in this regard.*

There are other typologies to describe environmental education; for example, environmental education *about*, *in* and *for* the environment first described by Lucas (1979). Education *about* the environment includes basic knowledge and understanding of the environment, which includes scientific theories, concepts, and laws (e.g. learning the niche of different plants and animals); education *in* the environment refers to using the environment as a resource with an emphasis both on planned inquiry and on investigations providing students with the opportunity to engage in first hand personal experiences. (e.g., exploring beaver dams, or the species in a local wetland ecosystem); while education *for* the environment is concerned with values, attitudes, and agency embedded within an ethical framework (e.g., participating in a campaign to preserve a local wetland ecosystem) (PALMER, 1998). Interestingly, this typology parallels the structure of many science education curriculum documents — knowledge, inquiry, and/or investigations and connections to science and society (STSE).

An historical analyses of environmental education practices suggest that earlier versions of EE (PALMER, 1998) during the 1960s and 70s for example, focused on nature studies and field work – learning about plants and animals and the physical systems that support them, as well as being outdoors – while more recent characterizations (2000s) of environmental education emphasize education for a sustainable future, and include creative and critical approaches to socio-ecological issues, eco-justice, long-term thinking, innovation, empowerment, and the interconnectedness of environment, economy, society, and technology. A critical orientation to EE includes always, attention to power, privilege, and socio-economic status. It recognizes that social inequalities and power imbalances are at the centre of environmental issues. Eco-justice advocates go beyond, for example, celebrating the wilderness through eco-tourism; or engaging in green consumerism (BOWERS, 2002; FURMAN; GRUENEWALD, 2004). These different orientations or ideologies create challenges for environmental educators. In school programs, discrepancies, for example, between action-oriented goals associated with the contemporary philosophy of environmental education and an emphasis on the acquisition of environmental knowledge and awareness effect policy, pedagogy and curriculum (STEVENSON, 2007).

It is beyond the scope of this paper to engage in a detailed analysis of each current or ideological tilt. Rather, I wish to emphasize the centrality of identifying ideological positions (or currents), in order to inform deliberate and thoughtful environmental education practices. Understanding the spectrum of theoretical and practical possibilities, allows educators to implement a range of educational strategies according to intended goals and context. Furthermore, understanding different ideologies allows for a more profound and critical analyses of the differing approaches, and provides an opportunity to create a complementary and comprehensive environmental education program.

## The Hegemony of School-Based Disciplines

The struggle to position environmental education in robust ways is deeply embedded in the hegemony of school-based disciplines. Advocates of environmental education navigate a school system that is steeped in history and tradition, where content and processes are typically taught through discreet subjects like geography, history or science. The nature of school knowledge, how it is organized in curricula, and status attributed to knowledge (STEVENSON, 2007; TAN; PEDRETTI, 2011; VENNVILLE; RENNIE; WALLACE, 2012), have implications for how environmental education is enacted in schools.

Consider for example, the topic of climate change which includes knowledge about: disappearing lowlands in Sri Lanka, the politics of the Kyoto protocol, the science and chemistry of climate change, human impact on ecosystems, and changing weather patterns. Where might this curriculum be positioned - in geography, social studies, citizenship or science courses? Or is this the responsibility of environmental education courses? How does environmental education – as a discipline - come to be privileged or marginalized? Some view environmental education as threatening the integrity of the disciplines and draining science, for example, of its disciplinary content. Others argue that if environmental education is relegated to the teaching of sciences (or infused across subject areas – as is the case in some jurisdictions), then the meaning and essence of environmental education is compromised.

Bernstein's (1971; 2000) notions of classification and framing are particularly helpful in understanding school practices, and the privileging of particular kinds of knowledge. Subjects such as mathematics or science are strongly classified and strongly framed. That is, there are clear boundaries between subjects and clear understandings about what is to be taught and learned. Other subjects such as environmental education, citizenship education, and media studies are integrated, weakly classified and weakly framed. The boundaries between these subjects are unclear, and there is ambiguity about what should be taught and learned. Consequently, integrated programs or subjects such as environmental education, often struggle to establish their identity or gain status, in a school system that is generally hierarchical, differentiating, and highly resistant to change (VENNVILLE; RENNIE; WALLACE, 2012). Stevenson (2007) makes a similar point in his analyses of curriculum and pedagogical ideologies. He suggests that there is a deep contradiction between high status, *public* knowledge being taught in schools and other knowledges that are more interdisciplinary, holistic and experiential.

If one were to ask what is the content of environmental education, we would be hard pressed to answer this question, precisely because environmental education is interdisciplinary, connective, and draws from a number of fields in innovative, holistic and creative ways. Perhaps the time has come to ask different questions, to move beyond the traditional hegemony of discipline-based subjects, and to imagine alternative ways of organizing knowledge. Venville, Rennie and Wallace (2012) ask the provocative question: what knowledge counts in a global community? They conclude that schools need to balance disciplinary and integrated knowledge, and connect global and local perspectives. What counts as knowledge needs to be

expanded to include (and legitimize) knowledge that is holistic, interdisciplinary, outward in its orientation, and “grounded in students’ experiences, relationships and contexts” (VENVILLE; RENNIE; WALLACE, 2012, p.9).

Admittedly, some may find it difficult to imagine a school system that organizes knowledge differently. Issues-based curriculum, case study approaches, and integration of disciplines in more formalized ways, offer some possibilities. Pedretti and Bellomo (in press) offer a conceptualization of a critical environmental education that is grounded in an issues-based approach. Such an approach includes: analyzing an issue: ‘why is this happening?’; recognizing power structures that underpin decisions: ‘whose interests are being served?’; re-imagining the future: ‘what kind of future do we want?’; looking for creative solutions: ‘how can we think outside the box’; and engaging in action: ‘what can we do to make a difference?’

## Traditional Ecological Knowledge and Wisdom

Discussions of hegemony and privileging particular kinds of knowledge and knowledge structures, must also include an examination of Aboriginal knowledge and its positioning with respect to environmental education.

Over time, and worldwide, we have witnessed how the exclusion of Indigenous people from the decision-making process, regarding resource management for example, has had devastating effects on communities. However, more recently Indigenous knowledge, has been sought and used to improve and enhance the understanding of environmental biology, ecology and science. Aikenhead and Michell (2011) suggest that the planet’s environmental crisis cannot be solved by Eurocentric science and technology alone, but rather, must call upon Aboriginal knowledge that has at its very heart, a reverence for all life. Indigenous Knowledge learned from Elders has led to an emerging field called *Traditional Ecological Knowledge and Wisdom* (TEKW). *Traditional Ecological Knowledge and Wisdom* is time-tested, with sustainability and environmental integrity at its very core (for a more detailed discussion of Aboriginal knowledge and science education, see AIKENHEAD; MICHELL, 2011; ALSOP; FAWCETT, 2010; REIS; NG-A-FOOK, 2010; SNIVELY; CORSIGLIA, 2001).

There is much to be learned from Aboriginal peoples and their relationships to the environment. Although traditional knowledge and ways of being vary across clans, tribes or nations, there are a set of shared commonalities that speak to ways of living in nature. These shared commonalities describe a relationship with nature that is: “place-based, monist, holistic, relational, mysterious, dynamic, systematically empirical, based on cyclical time, valid, rational, and spiritual” (AIKENHEAD; MICHELL, 2011, p.73). The words of F. Henry Lickers, biologist and member of the Turtle Clan of the Seneca Nation, eloquently captures First Nations peoples’ view about the interconnectedness of the earth and humankind:

*The First Nations people view themselves not as custodians, stewards or having dominion over the Earth, but as an integrated part in the family of the Earth. The Earth is my mother and the animals, plants and minerals are my brothers and sisters (cited in Canadian Council of Learning, 2007, p.2).*

In a Government of Nunavut (Canada) publication (2004), the importance of Elders as sources of knowledge and wisdom is established, along with the concept of Inuit *Qaujimajatuqangit*, that is, the Inuit way of life, which means:

- respecting others, valuing relationships and caring for people;
- fostering good spirit by being open, welcoming and inclusive;
- serving and providing for family and community;
- decision-making through discussion and consensus;
- developing skills through practice, effort and action;
- working together for a common cause;
- being innovative and resourceful, and
- respecting and caring for land, animals and the environment.

Proposed programs of study for Nunavut schools consist of interdisciplinary curricular strands all derived from Inuit *Qaujimajatuqangit*. Strands replace the subjects of the traditional school curriculum, reflecting a welcome departure from the tyranny of subject-based disciplines.

## Environmental and Science Education: Aligning Principles and Practices

Finally, let us consider the nexus between environmental and science education. The relationship between environmental education and teaching science is an on-going debate (see for example, GOUGH, 2002; SAUVÉ, 2005). Environmental education is often resisted in schools, and usually falls within the purview of science education (GOUGH, 2002). For some science educators, the environment serves as a hook, pretext, or motivator to stimulate student interest in a topic, or to provide social, ethical and political dimensions to an activity, while for others the environment is a central organizing theme for the curriculum. Sauvé's (2005) *scientific current* speaks directly to the relationship between environmental and science education. This current emphasizes a rigorous scientific approach to tackling environmental problems, and identifies cause and effect relationships. According to Sauvé (2005, p.17), "The main process is the induction of observation based hypotheses, and the verification of these hypotheses through new observation or experimentation." The approach is predominantly a cognitive one, where the environment is an object of knowledge to be understood in order that appropriate decisions can be made to inform later action. This current imposes *the* scientific method on the study of environmental realities, in search of an answer or *truth* as is customary in the sciences.

Sauvé's characterization of the *scientific current* rests on a conventional representation of science education as objective, rational and value-free. Unfortunately, this characterization has dominated school science for decades (BENCZE, 2001; HODSON, 2011; ROTH; CALABRESE BARTON, 2004). Typically, school science education privileges the acquisition of knowledge, with little discussion of epistemological issues, or the social, political context in which science operates. The coupling of science and values, and the notion of agency in science education are for

some, disconcerting, and beyond the mandate of science education. If this is indeed the prevailing state of affairs in science education, then any hopes of teaching an environmental education that is empowering, action oriented or critical in its approach, will be problematic.

The solution in part, lies in aligning the orientations and praxis of science education with environmental education. Rather than accept traditional science education and its rejection of values and action (GOUGH, 2002), the challenge is to re-imagine science education (as one possibility for positioning EE). Recent calls for reform in science education demonstrate a consistent view of science education as more than simply the acquisition of scientific concepts (see for example, CALABRESE BARTON, 2003; HODSON, 2011; ROTH; DÉSAUTELS, 2002). Science education, it is argued, must be situated within social, technological, cultural, ethical, and political contexts and realities. Science, technology, society and environment (STSE) education (PEDRETTI; NAZIR, 2011; SOLOMON; AIKENHEAD, 1994) and socioscientific issues (SSI) (ZEIDLER et al, 2009) are two movements that recognize the importance of re-conceptualizing science education to include informed decision making; the ability to analyze, synthesize, and evaluate information; nature of science (NOS) perspectives; the coupling of science and moral reasoning; and agency. Mainstream adoption of such emphases in science education would support an environmental education that seeks to develop a citizenry that is knowledgeable, able to make informed and responsible decisions, and willing to act in socially just ways. In other words, a post-positivist vision of science education that challenges the status quo is required in order to align with an environmental education discourse that supports a democratic and socially just imperative.

## Conclusion

This paper stems from my interest in understanding the location (both theoretically and pragmatically) of environmental education discourses in contemporary schooling. To that end, I problematized environmental education in relation to: 1) ideological orientations 2) the hegemony of school-based disciplines, 3) the positioning of traditional knowledge, and 4) alignment with science education. Such problematizing is necessary in order that disparate (and often contradictory) goals of schooling, environmental education and science education can be aligned to support an EE that is oriented towards social justice and citizenship. A more socially just and action oriented environmental education challenges the uncritical role of schooling as the reproduction of factual knowledge and unproblematic truths. Dominant conceptions, organization and transmission of knowledge are challenged, creating for many teachers conflict with their approaches to teaching and student learning (STEVENSON, 2007).

The relationship between environmental education and science education is particularly complex. While there have been changes to the rhetoric of what science education should be about, there is still resistance to the kinds of changes to current science education practice that many environmental educators seek. As Gough (2002) eloquently argues, science education and environmental education must reimagine themselves to create a mutual and compatible agenda. This shared agenda



would recognize and honour multiple perspectives, traditional knowledge, and goals of social justice and democratic participation.

## References

AIKENHEAD, G.; MICHELL, H. *Bridging cultures: Indigenous and scientific ways of knowing nature*. Toronto: Pearson Canada, Inc., 2011.

ALSOP, S.; FAWCETT, L. After this nothing happened. **Cultural Studies of Science Education**, vol. 5, n.4, p.1027-45, 2010.

BENCZE, L. 'Technoscience' education: Empowering citizen against the tyranny of school science. **International Journal of Technology and Design Education**, vol.11, n.3, p.273-298, 2001.

BERNSTEIN, B. On 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, 1971. p.47-69.

BERNSTEIN, B. **Pedagogy, symbolic control and identity: Theory, research, critique**. Revised edition. Lanham, MD: Rowman & Littlefield, 2000.

BOWERS, C. A. Toward an eco-justice pedagogy. **Environmental Education Research**, vol.8, n.1, p.21-34, 2002.

CALABRESE BARTON, A. **Teaching science for social justice**. New York: Teachers College Press, 2003.

CANADIAN COUNCIL OF LEARNING. **Lessons in learning, the cultural divide in science education for Aboriginal learners**. No city: Canadian Council of Learning, 2007.

FURMAN, G. C.; GRUENEWALD, D. A. Expanding the landscape of social justice: A critical ecological analysis. **Educational Administration Quarterly**, vol.40, n.1, p.47-76, 2004.

GOVERNMENT OF NUNAVUT. **Pinasuaqtavut 2004-2009: Our commitment to building Nunavut's future**. 2004. Available at <<http://www.gov.nu.ca/pinasuaqtavut/engcover.pdf>>. Accessed on 5, May, 2014.

GOUGH, A. **Mutualism: A different agenda for environmental and science education**. *International Journal of Science Education*, vol.24, n.11, p.1201-15, 2002.

HODSON, D. **Looking into the future: Building a curriculum for social activism**. Rotterdam: Sense Publishers, 2011.

LUCAS, A. M. **Environment and environmental education: Conceptual issues and curriculum implications**. Melbourne, Victoria: Australian International Press and Publications, 1979.

PALMER, J. **Environmental education in the 21<sup>st</sup> century, theory, practice, progress and promise**. New York: Routledge, 1998.

PEDRETTI, E.; BELLOMO, K. **Explorations in secondary school science: Practice and theory**. Toronto ON: Pearson Publishers, in press.

PEDRETTI, E.; NAZIR, J. **Currents in STSE education: Mapping a complex field, 40 years on**. *Science Education*, vol. 95, n. 4, 601-626, 2011.

REIS, G.; NG-A-FOOK, N. TEK talk: So what? Language and the decolonization of narrative gatekeepers of science education curriculum. **Cultural Studies of Science Education**, vol.5, n.4, p.1009-26, 2010.

ROTH, W. M.; CALABRESE BARTON, A. (Eds.) **Rethinking scientific literacy**. New York: RoutledgeFalmer, 2004.

ROTH, W-M.; DÉSAUTELS, J. (Eds.) **Science education as/for sociopolitical action**. New York: Peter Lang, 2002.

RUSSELL, C.; BELL, A.C.; FAWCETT, L. Navigating the waters of Canadian environmental education. In: GOLDSTEIN, T.; SELBY, D. (Eds.). **Weaving connections: Educating for peace, social and environmental justice**. Toronto, ON: Sumach Press, 2000. p.196-217.

SAUVÉ, L. **Currents in environmental education**: Mapping a complex and evolving pedagogical field. *Canadian Journal of Environmental Education*, vol.10, n.1, p.11-37, 2005.

SNIVELY, G.; CORSIGLIA, J. Discovering indigenous science: Implications for science education. **Science Education**, vol.85, n.1, p.6-34, 2001.

SOLOMON, J.; AIKENHEAD, G. S. (Eds.). **STS education**: International perspectives on reform. New York: Teachers College Press, 1994.

STEVENSON, R.B. Schooling and environmental education: Contradictions in purpose and practice. **Environmental Education Research**, vol.13, n.2, p.139-153, 2007.

TAN, M.; PEDRETTI, E. Negotiating the complexities of environmental education: A study of Ontario teachers. **Canadian Journal of Science, Mathematics and Technology Education**, vol.10, n.1, p.61-78, 2010.

UNESCO. **The international workshop on environmental education final report, Belgrade, Yugoslavia**. Paris, France: UNESCO/UNEP, 1975.

UNESCO-UNEP. **The Tibilisi Declaration**: Final report o the intergovernmental conference on environmental education. Paris, France: UNESCO, 1978.

UNESCO. **United Nations decade of education for sustainable development (2005-14)**: International implementation scheme. Paris, France: UNESCO, 2005.

VENVILLE, G.; RENNIE, L.; WALLACE, J. **Knowledge that counts in a global community**. New York: Routledge, 2012.

WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT, WCED. **Our common future**. Oxford, UK: Oxford University Press, 1987.

ZEIDLER, D.L.; SADLER, T.D.; APPLEBAUM, T.; CALLAHAN, B.E. Advancing reflective judgment through socioscientific issues. **Journal of Research in Science Teaching**, vol.46, n.1, p.74-101, 2009.

**Submetido em outubro de 2013, aceito para publicação em abril de 2014.**