Sensing Environmental Education Research

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Abstract

The field of environmental education research has been moving away from scientistic and positivistic discourses for some time now (Environmental Education Research*, 2000; Hart & Nolan, 1999). However, it has been noted that the meta-discourse about this research continues to draw on their framings, registers, and lexicons (Hart, 2000; Marcinkowski, 2000; Smith-Sebasto, 2000). Poststructuralist and critical approaches to discourse analysis highlight the constraints and possibilities in such discourse, including how we make sense of claims about the quality of research. With this in mind, the paper explores the meta-discourse about environmental education research, using "the science and art" of imaging and remote sensing of the environment to illustrate the forms and functions of techno-scientific language in this field. In so doing, the paper discusses a series of observations about interpretation and quality in environmental education research discourse, and constraints and possibilities in relation to the meta-discourse.*

Résumé

Le champ de la recherche en ERE s'éloigne des discours scientistes et positivistes depuis quelque temps déjà (EER 2000; Hart et Nolan 1999). Cependant, il a été noté que le métadiscours au sujet de cette recherche continue de puiser dans leurs encadrements, leurs registres et leurs lexiques (Smith-Sebasto 2000; Marcinkowski 2000; Hart 2000). Les approches poststructuralistes et les critiques de l'analyse du discours soulignent les contraintes et les possibilités d'un tel discours, de même que notre compréhension des affirmations sur la qualité de la recherche. Voilà pourquoi cet article explore le métadiscours sur la recherche en ERE, en recourant à la science et à l'art de l'imagerie et de la télédétection de l'environnement pour illustrer les formes et les fonctions du langage techno-scientifique dans ce champ. Ce faisant, l'article discute d'une série d'observations au sujet de l'interprétation et de la qualité du discours sur l'ERE ainsi que des contraintes et des possibilités par rapport au métadiscours.

> Remote sensing is the science and art of obtaining information about a phenomenon without being in contact with it. (Schneider, 2001)

For the purposes of this paper, I assume that a critical form of environmental education research attends to the scientific, ecological, political, and cultural practices that shape our (often unproblematized) understanding of society-economy-environment relationships. Drawing on insights from critical discourse analysis, I contend that investigating the production, negotiation, and consumption of knowledge claims by researchers is essential to understanding the complex relationships between environmental (and) educational "experts" and their "audiences" of teachers, students, schools, and communities. This is because the discourse of every actor mobilizes or silences rival claims about adequate, legitimate, and truthful ways of sensing, interpreting, and managing knowledge in environmental education.

Discourse is the transactional basis for a range of activities in environmental education, including dialogue, argument, and communication about the quality of teaching, learning, and research. Yet, while discourse is the substance and conduit of discussion, it is also much more. Drawing on the work of Bakhtin (Todorov, 1984), Escobar (1995), and Fairclough and Chouliaraki (1999), critical discourse analysts argue that discourse should not be treated as simply the expression of thought. Rather, it is a set of practices, with conditions, rules, and historical precedents that locate, constrain, and enable our discursive utterances within inter-individual networks and "orders of discourse" (Foucault, 1981). For Fairclough (1992), recognition of Foucault's explanation of dominant, subaltern, and contesting orders to discourse is fundamental to a reflexive research community in that it articulates what has become imperative to poststructuralist analysis: to interrogate:

- the socially structuring configurations of discursive practices;
- their associations with particular social spaces and the "regimes of truth" that researchers use to situate their projects; and
- the shifting boundaries and flows between such sites of truth/power.

For a community of environmental educators, the challenge of Escobar's (1995) comments are potentially far reaching: "changing the order of discourse is a political question that entails the collective practice of social actors and the restructuring of existing political economies of truth" (p. 216).

This paper starts with an illustration of these arguments in terms of the sense-making process in environmental education research. I then use remote sensing as a picture to extend the initial considerations into reflections on the roles of assumptions and practices for environmental education researchers, and conclude with a commentary on their implications for how sense is made of the quality of research in environmental education.

Background

My starting point in applying this form of analysis to this area is to observe that the nexus of ideas that shape environmental education research discourse can be viewed as being primarily drawn from two broad areas: *environmental research* and *educational research*, beyond the self-same discourse. Both provide distinct contributions to environmental education research: for instance, *environmental research* to the content of environmental education, and *educational research* to the effectiveness of environmental education initiatives (Hungerford, Peyton, & Wilke, 1980). However, while debate on the relative influence of each area in environmental education continues, discussion of their effects on environmental education research itself has been limited (Hart, 2000), including how their discursive practices operate within the research discourse.

Where discussion does take place, as in *Environmental Education Research* (2000), it tends to focus on:

- clarifying positions on the role of research in environmental education (e.g., to legitimate or challenge particular initiatives or traditions);
- appreciating the merits and limitations of alternative approaches and research crafts (e.g., to establish the contents of the researcher's "methods toolkit"); and
- ensuring procedural regularity and correctness (e.g., to enhance the quality of research).

This is, Hart (2000) notes, rather than expressing the implications of different ontologies and associated epistemologies on methodologies and methods within a particular system of inquiry. That this latter discussion is critical to research discourse is underscored by two related sets of claims. First, claims to "synergy" and "holism" have rhetorical appeal and currency in the literatures of environmental education and environmental education research, and to their intersections (Grün, 1996). Second, research-informed and evidence-based content and approaches receive support in environmental education, primarily in relation to environmental content, but increasingly to educational matters (Reid & Nikel, 2003).

With this in mind, I consider environmental education research discourse to be a form of claims-making about environmental education, in which some claims are accorded legitimacy and others are "rebuffed" (see Hannigan, 1995, p. 4). Claims-making as an analytical focus highlights the effects of conflicts arising from differences in epistemology in *environmental research* and *educational research* on the meta-level discourse of environmental education research, through arguing for an examination of how claims are:

- created, legitimated and contested, from a Foucauldian perspective; and/or
- constructed, framed and elaborated, when viewed from a social constructivist perspective.

By way of illustration, at one level, difficulties can be identified regarding the contrasting disciplinary structures of *environmental research* and *educational research*, and the distinctive cultures that have emerged in these differing fields of inquiry (Foster, 1999). Thus, we might note that in relation to *educational research*, such a discussion draws attention to a shift in the assumptions, frameworks, and criteria of educational inquiry (Denzin & Lincoln, 2000). Those of qualitative methods of inquiry are now embraced within environmental education research, when quantitative, empirical-analytic, and positivistic approaches were once the order of the day (Marcinkowski, 2000).

Such shifts, and the features of environmental education research that now exist, are fundamentally dissimilar to those of *environmental research* (including remote sensing), within which researchers and educators have often relied on quantitative methods (descriptive, correlational, causal-comparative, experimental, etc.) to inform the content of environmental education and research (e.g., Stanisstreet & Boyes, 2000). Increasingly, the research programmes of "environmentalists" are not necessarily the programmes of "educationalists" nor are the ways in which "sense is made" in either area.

Furthermore, within environmental education and environmental education research, there are claims to complementarity, synthesis and interdisciplinarity (Stables & Scott, 2002), yet these claims have been viewed as either ignoring the features of unique, historically situated forms of insight, or an attempt to accommodate them at methodic rather than metaparadigmatic levels, as if philosophical differences can be put to one side (Hart, 2000). This raises a second set of issues regarding:

- differences in ideological and ontological orientations;
- their interaction in differing ways of knowing; and
- claims to warranted belief and action and the foundations attributed to them.

For example, at its core, the discourse on *educational research* is people-centred and goes with the grain of anthropocentric orientations and ideologies (environmental or otherwise). In contrast, the discourse on *environmental research* can convey much other than this, for example, bio/ecocentric ideologies and orientations and the "New Environmental Paradigm" (Dunlap, Van Liere, Mertig, & Jones, 2000), which may be quite opposed to overtly anthropocentric frameworks, largely owing to a different worldview (Gough, Scott, & Stables, 2000).

Such initial observations disrupt the confidence that might be placed in positivist and post-positivist accounts of the roots of environmental education. In presenting datum after datum of what has come to constitute environmental education through perhaps a markedly atheoretical register (e.g., Palmer, 1998), critics have noted that such histories tend to locate the roots of environmental education in the cognitive and professional interests and

legacies of environmentalists rather than educationalists per se (Goodson, 1996; A. Gough, 1997; Marsden, 1997), and environmental researchers rather than educational researchers per se (Benton & Short, 1999; Stern & Dietz, 1994). Furthermore, as I have argued previously, environmental education researchers have occasion to "believe in: the existence of 'social facts with a single objective reality'; observable and objective social truth; the possibility of the avoidance of bias through researcher detachment from the research setting; the efficacy of adherence to predetermined, inflexible research procedures" and further subscribe to "the justificatory notion that they and 'natural and physical' science practitioners are the joint custodians of these perceptions" (Gough & Reid, 2000, p. 48). These observations foreground the effects of these beliefs on the epistemological, ontological and environmental frameworks of environmental education. This includes, for example, the absence of critique of the adequacy of the narratological groundings of environmental education research discourse, within the discourse, and beyond to other areas.

In short, while the contributions of both environmental knowledge and educational knowledge to discourse on environmental education research are inevitably partial, situated and provisional, this is not always acknowledged in a literature that has been dominated by the "professional-scientific" view of research in environmental education noted above (Gough & Reid, 2000). Hart (2000), for example, expresses concern at "superficial dialogues about method and simplistic debates about essentially related schools of thought" (p. 38) in relation to educational research discourse in environmental education research. Might this also apply to the ontological and epistemological aspects of environmental research discourse in environmental education research?

This then is the background to the crux of the argumentation that follows on how we make sense of the meta-discourse. Through this paper I draw on such ideas to suggest that we heed Hart's (2000) plea to consider issues of purpose, value, and assumption that shape the act of inquiry, rather than assuming that discourse on environmental education research is primarily a matter of addressing the researcher's craft, the means of inquiry, technical proficiency, or even procedural competence, valuable though this is for environmental educators.

The wider issue identified herein is to address cognitive and professional interests and their legacies and impacts on discourse about environmental education research. To illustrate this theme, I use the example of remote sensing and imaging the environment as a picture to explore how sense might be made of research in environmental education, firstly, as a means to furthering such discussion, but also to signal a wider debate in environmental education[1] that invites readers to:

- appraise the language of non-invasive techniques, calibration, and interpretation; utility, modelling, and application; tools, systems, and resources; and mastery, authoritativeness, and the expert in research;

- problematize why terms like "measurement," "prediction," and "behaviour" are no longer able to dominate the field of environmental education research; and
- disrupt notions of lived experience; spatial, temporal, and social constraints; and interdisciplinarity in this field.

The next part of the paper presents the remote sensing example, after which I attempt to broaden the "polyphonic" aspects of the argumentation by introducing some "contrapuntal" themes.

The Case of Remote Sensing

> Photogrammetry and Remote Sensing is the art, science, and technology of obtaining reliable information from non-contact imaging and other sensor systems about the Earth and its environment, and other physical objects and processes through recording, measuring, analysing and representation. (International Society for Photogrammetry and Remote Sensing, 2001)

As suggested above, environmental research techniques rely on a technology and an interpretative principle. Sensing methods may be somatic, corporeal (i.e., based on the body—manual, visual, etc.) or some extension of these (e.g., remote sensing techniques, including the electro-optical, microwave/acoustical, etc.) so as to broaden our sensory modes, ranges, and capacities for data detection, identification, and analysis. In the case of remote sensing, methods necessitate non-contact (non-invasive) observation and thus remove the "human experiencer" as a direct "sensor." At the same time, they highlight the role of interpretation in both explicating and accounting for the qualities "revealed" in the data (typically in quantitative form), frequently relying on computer technologies in the first place, but also the experience, interests, and expertise of the researcher to garner meaning from the data representation.

Reframing this example in the light of the earlier discussion, remote sensing involves the use of instruments or sensors to "capture" the spectral and spatial relations of objects and materials observable at a distance—typically from above. An aerial photograph is a common example of a remotely sensed product (by camera and storage medium). Its relevance for discussion of ontology, epistemology, and methodology in environmental education research discourse is made clear when we consider how time, space, place, and sign/symbol structure the reality being sensed, and the sense-making process/product (Payne, 1999). To continue, remote sensing typically involves precise measurement of biological, chemical and physical characteristics of a terrain (location, height-depth, temperature, moisture content, chlorophyll content, surface roughness, etc. for data on vegetation, soils, minerals, water, ice, and the atmosphere, and so on) as a means to interpreting environmental qualities, and for purposes of monitoring, prediction, and control. The close relationship between technology, teleology, and interpretation is

emphasized in the possibilities available to the analytical process, which, in turn, are related to notions of perspective, purpose, and viewpoint. Thus remote sensing of the environment is often justified in terms of assaying the earth's resources to inform and implement resource management strategies.

Technologies of remote sensing are diverse in a variety of ways, whether it be in terms of: sophistication and penetrative gaze, the art and science (and history) of photography (visible electromagnetic range to multispectral ranges), and even the aerial platforms (birds > balloons > kites > aircrafts > satellites) of the technology. With the advent of sub-orbital and orbital satellite sensor systems, a simplified but general model of remote sensing might involve:

- acquiring data from electromagnetic radiation in the visible, near-infrared, middle-infrared, thermal infrared, and microwave portions of the spectrum on absorption, reflection or emission;
- calibrating/processing the signal;
- analyzing the data using a variety of image processing algorithms, such as photogrammetry techniques; and
- presenting or displaying the results as images or spatial information systems.

The outputs, like false colour imaging, ratio codes and brightness codes, and layered and composite images, remind us of the role of the interpretive process as the vehicle for rendering the data intelligible to the mind. We might also consider the conceptual lexicons and *telos* attributable to notions like scaling, real world modelling, global imaging, combining and scoping, and the issue of resolution uncertainties. Expressed here are desires typically associated with the pursuit of prediction, finality and control, and that the techniques can be extended. In the case of the latter, remote sensing and photogrammetry techniques are increasingly applied to other fields, like medicine, health, engineering, robotics, architecture, archaeology, etc. for close-range examinations and interrogations of bodies and sensory capacities. The techniques remain in the domain of the technical-scientific and the associated discursive practices of the "sciences" rather than the "arts." One effect, it appears, is to reassure us that we may feel sure and confident of the claims made through remote sensing and imaging as a way of knowing environments.

Applied Fields and Meta-theoretical Activities

Two observations are offered about this example in light of the earlier discussion, before considering the role of interpretation further.

To return to an earlier point, in general, both "education" and "environment" are regarded as applied fields. That is, they tend to derive their cognitive structures, purposes and methodologies from elsewhere (typically, we might assume, the

human and the natural sciences, respectively). As such, two effects are apparent. First, speculation about teleology—explaining what is happening in terms of what is to be achieved—will often locate the "ends" of "education" and "environment" beyond their substantive domain, as in deliberations on purposes, intentions, or goals. Thus, pursuit of educational ends may be justified by reference to securing a socio-economic imperative, like "training or equipping the workforce," while environmental ends, as in remote sensing, may refer to ensuring efficient resource use, to continue the earlier example. In the specific case of environmental education, both may be regarded as inadequate and an attempt may be made to move beyond both; overarching imperatives for environmental education are typically expressed in terms of slogans like "saving the planet" or "securing a sustainable future." Thus, in providing a link with research, Smith-Sebasto (2000) writes: "it would be far more productive to explore how the complementary methods of inquiry can be employed *collaboratively* and *cooperatively* to more completely explore the issues facing EE as well as society's challenge to develop in an ecologically sustainable manner" (p. 13).

In Foucault's work (1973), the problems associated with "applied" fields are explained as those of the human sciences in general. That is, their difficulties are attributed to, "their dangerous familiarity with philosophy, their ill-defined reliance upon other domains of knowledge, their perpetually secondary and derived character, and also their claim to universality," (p. 348) with the further observation that all of the human sciences: "interlock and can always be used to interpret one another; their frontiers become blurred, intermediary and composite disciplines multiply endlessly, and in the end their proper object may even disappear altogether" (p. 358).

Second, in terms of the meta-discourse on research, debates about questions of ontology, epistemology and methodology—regarding educational or environmental dimensions—tend to repeat the distinctions made between the two areas, and are often at one remove from (or out of step with) the debates of each "parent discipline." The upshot is, the meta-discourse on environmental education research tends to be chronologically and epistemologically delayed from those of the "state of the art" (or what we might call the "state of the ark"), when we consider inputs from environmental and environmental educational contexts (Connell, 1997; Eisner, 1997; Palmer, 1998). While the distance this creates has strategic benefits for would-be protagonists and casualties in a "paradigm war," observers of this "conflict" may regard environmental education research discourse as little more than a "derived discourse," and thus, in other senses, perhaps even remote, isolated, or anachronistic, as befits an ante-bellum field (see Eraut, 1985; Mrazek, 1993; Rickinson & colleagues, 2000).

My second point is, as with the "science" and "art" in the remote sensing example, emphasis on the "progeny" of the conjoining of education and environment

in this discourse—which I take here to be represented by the activities of environmental educators—may draw the focus of analysis in meta-theoretical discussion away from debates and issues about parentage (and ontological or epistemological compatibility) towards a focus on environmental education, its necessity, and the interconnectedness it represents between educational and environmental discourse. To illustrate, debates about UNESCO's "priority of priorities," whether it be reorienting teacher education to include environmental education or "reorienting teacher education to address sustainability" as more recently expressed (Hopkins & McKeown, 2001), must now also attend to claims within UNESCO to extending its conceptual "family", such that: "Learning from the successful experiences of other education reform movements, and interpreting their lessons to education for sustainability, must become the new priority of priorities for education" (Fien, 2000, p. 275).

In relation to the argument being developed here, this suggests that a clear sense of the social construction of environmental education and the ordering of discourses (for example, we might ask, *why is this the priority exactly, and how did it come to be so?*) is absent as the discourse shifts towards incorporating a kind of "ontological gravity" that its "parents" nor some commentators in the field would necessarily wish to see it exhibit (Gough, 1991; N. Gough, 1999).

Furthermore, with regard to the ordering of discourses, both within and beyond the environmental education community, the central issue in this illustration is the claim that it is to be "the priority of priorities for education." That is, of course, if the claim is not intended as a rhetorical ploy or meant figuratively. If it is to be taken seriously, it is certain to raise the eyebrows (metaphorically and literally?) of other actors in the wider education arena who suppose their education has priority status, if not more, or who question whether the pursuit of this end (telos) is actually desirable or possible. (A case in point will be responses to the UN-sponsored Decade of Education for Sustainable Development, 2005-2015, an outcome of the Johannesburg Summit on Sustainable Development.) In many countries, for example, this may be seen as in competition with government policies promoting literacy, numeracy or key skills, or internationally, in the NGO-led sector, advocates of other adjectival educations, like "education for peace," or "education for citizenship." For UNESCO, tensions exist with supporters of "basic education provision" who regard this as separate from "education for sustainability" though it could be argued that in each of these examples the competing priorities, and orders of discourse, are intimately connected (Reid, Scott, & Gough, 2002).

Also in relation to earlier comments, it is noted that routes to securing the goal expressed in this "priority of priorities" are varied. Earlier work by Fien and colleagues (e.g., 1993) suggests a preference for merging the co-extensive dimensions of environmental education and environmental education research, such that the particular truths of the former become

inseparable from the truth-seeking practices of the latter, through, for example, the use of (participatory) action research.[2] Despite its apparent strengths or drawbacks, it is not the method that is at question here. Rather, as outlined in the opening section to this paper, such a route is important for understanding the way in which key issues for research discourse are then framed. For instance, in carrying out such research, does this imply consensus and implementation regarding "the priority of priorities," rather than an inspection of what is concealed and rendered natural or neutral about environmental education research and environmental and educational discourses: namely, its nature(s), purpose(s), status and practices (Stables & Scott, 2002)?

The "priorities" trope may well lead to silence about the art and politics of knowledge construction for education and about environments in environmental education research, such that the core claims of environmental education come to represent a literal, encompassing, and stable truth about the world, ourselves, others (species, beings, environments, etc.), and the ties that bind each together (Payne, 1997). As English (2000) observes, in such circumstances the "truth" attributed to the processes and products of researching—principles and/or practices—can be presented as singular, unequivocal, and transcendent, where what is meant by transcendence implies that the design of the research or the substantive outcomes are beyond reproach. It isn't that students or teachers or researchers cannot form alternative opinions about educational research or environmental research in environmental education. Rather, it is that within this particular framework for truth claims and claims-making, there is either little opportunity or few means to do so.

Thus, if taken literally, critical discourse analysis alerts us to the fact that accepting the kind of contention that Fien makes above risks erasing the multiplicity of truths of other forms of environmental education knowledge, its production and contestation, within a uniform education for sustainability (Jickling, 1997).

W(h)ither Environmental Research?

If this is a possibility with the truths of other forms of education, that is, they become incorporated (or not) into this particular "regime of truth" about environments and sustainability, we might also consider the fate of the "Other," that of environmental research within environmental education research discourse. Thus, in terms of its significance for research as a whole, which tends to be evaluated against the criteria of making a substantive contribution to empirical knowledge and/or advancing theory, further discourse analysis might pursue whether environmental research is regarded as "good" in educational terms, or educational research as "good" in environmental terms?

This reframing relocates both environment and education toward the centre of analysis and draws attention again to issues concerning the ordering of discourses. Or, as Noel Gough (1999) puts it, if they aren't at odds with each

other, rather than examine, "what education can do for environmental quality," we might interrogate, "what environmental qualities can do for education," and the generative possibilities that environments and environmental subject matters, "offer to education conceived as educare—as a 'bringing forth' of human life" (p. 416). Such an approach helps problematize simplistic or dualistic readings of the relatively open notions of *environmental research* and *educational research* in this paper, and the associated risks of tautology in the earlier observations. For example, is quantitative research to be solely equated with "science" and "scientific method," positivist approaches with empirical-analytic traditions, and environmental research exclusively with any of these categories (Connell, 1997), particularly to the exclusion of fictive work and reportage on environments as other ways of knowing? On the latter, Stephen Gough highlights the work of writers like Barry Lopez for environmental education researchers. For Lopez (e.g., 1998), as in the earlier example of remote sensing methods, with the body and its "technologies" as "research instruments," the senses and observational and interpretive skills provide the "data" and the grounds for his claim that "truth is so much more than fact," and that the interpreter does well to be open to being disturbed by the "distance between what I saw and what I wanted to record" (Stephen Gough, personal communication, 2001).

The next section continues this shift of emphasis to consider further notions of interpretation, and their implications for how sense is made, and quality judged, in environmental education research, the subject of the final part of the paper.

The Role of Interpretation

The account given in the opening sections—in constructing and reassembling environmental education to illustrate specific points—was predicated on an understanding that the importance given to interpretation by practitioners, academics, researchers, policy-makers, publishers, etc. is fundamental to personal, philosophical and practice-based evaluations of what counts as environmental education and environmental education research. (While what is meant by interpretation is beyond the scope of this paper, a range of perspectives is illustrated in Figure 1.)

> . . . interpretation is an act of imagination and logic. It entails perceiving impor-
> tance, order, and form in what one is learning that relates to the argument,
> story, narrative that is continually undergoing creation.
>
> Interpretation has to do with the confluence of questions, images, and ideas
> that are the starting point of my inquiry, or the conceptualizing of my study.
>
> Interpretation has to do with where I choose to look to see that something is
> going on with regard to my conceptualization, or the situating of my study.
>
> Interpretation has to do with the judgment of what to collect that provides doc-
> umentation for what I think is going on, or the instantiating of my study and
> the further focusing of its field of inquiry.
>
> Interpretation has to do with what to select for writing that establishes or
> affirms what I have identified that has gone on, or the composing of the ele-
> ments of my research story.
>
> Finally, interpretation has to do with a perspectival accounting for what I have
> learned, or the shaping of the meanings and understandings of what has gone
> on from some point of view, an issue of the crisis of representation for some
> observers . . . . It is inconceivable to me that I can conduct any aspect of my
> research except from some point of view, which is to say that other inter-
> pretations, other meanings and understandings, are imaginable. Indeed, they
> may offer sturdy competition to my own. For everyone's work, however,
> there is a court, not of last resort, but of public discourse. It comes into session
> when our work is published.

Figure 1. Perspectives on Interpretation (from Peshkin, 2000, p. 9).

The argument now considers how sense is made of the meta-discourse, in terms of researchers' commitments, habits, and dispositions towards particular notions of interpretation, as they relate to claims to truth in environmental claims-making (Hannigan, 1995), and to distinctive methods and logics of inquiry. For illustrative purposes, three positions on the respective roles of qualitative and quantitative research in environmental education research are introduced to demonstrate some of the complexities in understanding interpretation differently and their links to differing orders of discourse. The positions emphasize the processes of selecting and interpreting in research, and the descriptive and explanatory aspects of environmental education research.

- A first position is that qualitative research can be useful in a pre-design stage of quantitative research, to help clarify the research question and "language and grammar" of the research design, including aiding conceptualization

and generating hypotheses for later research (Connell, 1997). Qualitative methods may also be used to interpret, qualify, or illuminate the findings of quantitative research and to test hypotheses. Such a position can be found in pragmatic justifications for choosing either integrated or separate research designs in research, for example, when the matter is framed as two questions (Walker, 1997): *What do we want to know? Which approach is likely to answer the question most effectively and efficiently?*

- An alternative to the first argues that the systematic methods appropriate to the research objective, whether qualitative or quantitative, are fundamentally incommensurable as they offer such different ways of knowing about the world that they cannot be compared. With this position the risk that emerges is that research design is reduced to simply a matter of personal preference (albeit with due reference to context, question, resources, argument, etc.). While exclusivist approaches to research can be recognized here (often expressed in arguments for the superiority of a particular method), this does not preclude pluralistic approaches. A virtue in sustaining multiple approaches is to stimulate different ideas or approaches to the research objective (Cantrell, 1993). This tends to require decisions about whether some ways of knowing are more valid than others, and on what basis they are complementary (Reid & Gough, 2000).

- A third position is to argue that whatever method produces data and results most favourable to a prior normative claim should be possible, allowed and/or sanctionable in research. This position rejects most traditional ideas about the "science" (and it is argued, the purported neutrality and objectivity) of educational research. Claims to scientific status may mask a desire to control practice in the interests of particular, apparently disinterested, social groups. Such a position may be associated with suggestions that some ends are morally superior to others, as in standpoint research or environmental activism (see A. Gough, 1999; Robottom & Hart, 1993).

So, from a discourse analysis perspective, we might ask a number of questions of each position regarding interpretation in environmental education research. Firstly, the status of the research acts, in terms of epistemology, methodology, and ontology (e.g., in relation to their assumptions about the realities of the researching and the researched); and then, to return to an earlier observation, whether they allude to educational or environmental research criteria in terms of judging the quality of the knowledge constructed through environmental education research?

The first set of questions has been discussed by Robottom and Hart (1993), Hart and Nolan (1999), and Hart (2000). These publications argue that different ontologies and associated epistemologies have definite implications for methodologies and methods that cannot be ignored by researchers. To illustrate, Hart argues that understanding the diverse complexities—"the requisite variety"—of qualitative inquiry not only challenges any methodological

uniformity within environmental education research discourse, but philosophically, it reveals the epistemological and ontological limits of research, qualitative or quantitative, educational or environmental. Hence Hart argues that environmental education researchers:

> . . . need antifoundationalist standards which account for the distinctions between method and methodology, epistemology and ontology . . . Whatever our stance, certain issues relating to relationships (at several ontological levels), perspective (or point of view), interest(s) served, representation (i.e. authenticity), legitimation (i.e. authority), text (i.e. verisimilitude), voice (absent and present), and mediating technology . . . must be addressed across the more conventional criteria related to problem, process and communication in research. (p. 43)

These points are intimately linked with the second issue regarding research criteria, which stresses the importance of considering the resources available for discussing the art and politics of knowledge construction. This topic will be discussed in more detail in the following section to introduce the theme of diversity in notions of quality in environmental education research discourse, but also to note that this diversity can be traced to the multiplying roots of the discourse as the legitimacy and views of the professional-scientist in constituting it become more contested (Gough & Reid, 2000).

The (Im)possibility of Criteria?

Attempts to develop criteria for judging the value of research are well documented and critiqued in environmental education research and include a focus on deliberating on the range of objectives deemed pertinent to quality research (see *Environmental Education Research*, 2000). They include:

- Does the research meet technical and aesthetic requirements of well-designed research?
- Is there the expectation that the research finds out more about a particular problem?
- Does it demonstrate that alternative plausible explanations have been considered?
- Or, perhaps, has the research stimulated debate and challenged complacency by forcing people to confront issues and arguments that would normally go unacknowledged?

While a neat mapping of such "criteria" against the three positions obscures the potential value of each to the other, in relation to discourse about the quality of research, these examples highlight a tension in the accounts of researchers to communicate both the substantive findings of the inquiry, and their (interlocutory) deliberations about the taken-for-granted assumptions of the research field (in addition to those of the community of researchers,

participants, practitioners, policy-makers, etc.), matters illustrated at length by Seale (1999).

A key example of such tensions is the role of "audience". We might ask, does the author assume that the audience is primarily one of environmental researchers, educational researchers, environmental education researchers, etc., and what effect does this have on reporting practices and the outcomes of the research (Hart, 1996)? Then there is the reader, their reactions and re-interpretations of a text: "Most writings about the ways in which research should be judged are concerned almost exclusively with the ways in which the research was done, and not with *the ways in which the standpoint of the reader will influence their judgement of that research*" (Garratt & Hodkinson, 1998, p. 524, my emphasis).

These points reanimate a previous argument (Reid & Gough, 2000, p. 71) that the use characteristics of research (qualitative or quantitative) merit attention, particularly when discourse theory reminds us of the primacy of the reader's interpretation of the report, now that the author's viewpoint can no longer be regarded as occupying a privileged position for its interpretation. Moreover, the evaluative criteria brought to bear on a text may well be those of an audience who are not necessarily the one that were hoped for by the researcher, for example, those of the casual reader or "grazer" of reports, or even the "magpie reader" in search of juicy quotes and anecdotes.

What then of the records, accounts, and products of qualitative research as analytical tributes[3] to the often mundane and routine work of analysis in investigation? In terms of this argument, they remain the material for a wider debate on making sense of environmental education research and where our attention lies regarding the social, temporal, historical, and/or environmental as dimensions to the epistemologies and ontologies of research. For example, qualitative research practices are characterized by a range of features, including:

- adopting the perspectives of the people being studied;
- description of the setting of the study;
- emphasis on context and on holism;
- emphasis on process; and
- flexibility of design and reluctance to impose a priori frameworks.

Practices expected in qualitative research that point to quality matters might then include:

- a clear exposition of the context and the way(s) in which data have been produced, collected and analyzed to suggest and justify findings, explanations, and interpretations; such that an account of circumstances and procedures makes plain a reflexive account of the researcher's own prior personal, theoretical, and even political biases, recognizing the role of values and a priori assumptions in shaping any research account;

- demonstration of engaging in a conscientious search for data that are inconsistent with the emerging analysis, and their impact on the "falsification" or refinement of analysis, within or outwith the study (e.g., prior research); and
- commitment to voicing multiple perspectives, of the powerful and powerless, the participants and the researchers, and addressing the relevance of the outcomes to different groups, needs, and time frames (e.g., not just to the sponsors of the research, but also to the wider body of knowledge and interests and directions within it, short term and long term).

Some of these practices, associated with rigour, clarity, and systematicity, might also be expected of quantitative research, albeit in different forms (Smith-Sebasto, 2000). For the meta-discourse though, they can also be read as implying that discussions should not be narrowly defined but broadly based, establishing (rather than shrouding) points of reference and debate on theoretical and practical issues, and even being imaginative and creative in pursuing their interpellations with the realities of the research (Peshkin, 2000). It is perhaps of little surprise then that the "reader effect," taken with the unique qualities and crafts of qualitative research, has led to demands for a culture of reporting practices that involve accounting for the processual, situated, and dynamic nature of the environmental education research and its subject matter, such as:

- the explication of the theoretical assumptions of researchers in reports, and how (lightly?) they are held;
- the difficulties of interpreting one's own and other's meanings and perspectives, e.g., about events and interactions, and the politics of relationships and representation between researchers and participants;
- the theoretical resources that inform and justify a particular qualitative method and interpretive strategy, such as those used in avoiding anecdotalism, literalism, and the imposition of the researcher's prior assumptions upon his or her observations; and
- engagement with the complexities and contexts in the situation to hand (e.g., via prolonged engagement, progressive focusing, emergent research design, hypothesis generation), and matters of generalizing from the ideographic and embedded to other settings, processes or cases, whether they be theoretically- or empirically-based.

The wider point to note here, first aired at the start of the paper, is that such criteria are derived from qualitative research discourse, rather than that of "environmental research."[4] Likewise, given the diverse nature of qualitative inquiry, we might also ask, can the standards, expectations, and criteria of quantitative research in education be applied across the board—like validity, reliability, and generalizability—to inquiries that stress postpositivist concerns like credibility and relevance; constructivist concerns like trustworthiness and

authenticity; critical theory concerns like action, praxis, and historical situatedness; and antifoundationalist concerns that stress reflexivity, subjectivity, and emotionality (Hart, 2000)?

The heading for this section echoes that of concerns expressed in *Environmental Education Research* (2000) about research being a highly contested field, as typified by the disjunctures between anti-realist, relativist, and (subtle?) realist positions on research, alongside the problematics of necessities and possibilities in developing criteria for evaluating the quality of research such that it informs policy and practice. On the one hand, there is the challenge for researchers expressed by Seale (1999) that there can be no criteria for judging the quality of qualitative research products given the nature of the task. This view articulates the case against any notion of a perfect, impeachable form of research, qualitative or quantitative, educational or environmental, as a study or as a report of findings. It is also a point alluded to by Peshkin (2000) who responds to the final entry in Box 1: "Rarely, except in highly controlled or consensually defined situations, can research be a simple form or record keeping and summary. More often, however, when it is unclear which interpretation is correct, or whose, the very nature of the "problem" is open to question" (p. 5).

On the other hand, we might want to consider how ontological, epistemological, and methodological dimensions are addressed, as in the example of remote sensing and imaging. For example, Britzman (1995) asks how discussion of research is made intelligible by questions like:

- What is it that structures (technologies, ontologies, epistemologies, etc.) the methodological imperatives for research, the researcher's stances, and their voices?;
- Which are the kinds of theoretical traditions through which data are constructed, represented/imaged, and narrated?;
- What are taken to be problems suited for research?; and
- What are the problems of how one might read against the grain of research?

In responding to these challenges then, despite the superficial connections that might be made between accounting practices in qualitative research and other "quality indicators" like "ecological validity," it appears that the criteria of environmental education research are essentially anthropocentric and leave little room for alternative, less anthropocentric frameworks for judging the quality of environmental education research.[5]

Conclusion

Poststructuralist theories raise critical concerns about what it is that structures meanings, practices, and bodies, about why certain practices become intelligible, valorised, or deemed as traditions while other practices become discounted,

impossible, or unimaginable. For poststructuralists, representation is always in crisis, knowledge is constitutive of power, and agency is the constitutive effect, and not the originator, of situated practices and histories. (Britzman, 1995, p. 231)

This paper has drawn on critical discourse arguments to suggest that all research activities have something to say about methodology, epistemology, and ontology, explicitly or not. Previously I argued (Reid & Gough, 2000) that deliberations on the process and product of judging the quality of qualitative research in environmental education research require the recognition of two points within the literature on guidelines:

- the existence of a wide variety of types, genres and forms of research; and
- the proposition that the criteria for judging research quality contain within them, implicitly or explicitly, a defining view of what research is, and perhaps more contentiously, what it should be.

Here, such arguments have been applied to environmental education research discourse to emphasize the unequal roles and contributions of educational research discourse and environmental research discourse to the meta-discourse.

The streams of environmental education research discourse about science, nature/environment, education, experience, and so on, along with other widely available narratives about awareness, sensitivity, commitment, and action, help form the cultural and conceptual tools of the environmental educator (Payne, 1999). In this paper, I have attempted to encourage further exploration of how environmentalists, researchers and educators negotiate the meanings of these discourses, including which discourses they invest authority in, which they find personally convincing, and which discourses break down or seem useless.

Human beings make meaning in their lives through storylines and narratives that are accessible at a given cultural and ecological time. As Lather and Smithies (1997) argue, no life fits entirely into any storyline, and everybody has to work to make meaning across/within/beyond/outside the narratives and discourses available to them. Hence the desirability of research and researching. Some storylines help us tell our lives in what we see as positive ways, others "tell us" less positively, environmentally, educationally or otherwise. Within the discourse on environmental education research, some of the narratives will be chosen and used consciously, others will simply "tell us" without our consciously knowing. Their interpretive function, for/of environmental education researchers and others, is not uniformly complimentary, particularly when viewed with the benefit of hindsight. As Noel Gough (1999, p. 412) suggests in the context of significant life experience research, our inquiries can speak of restoring life to its original complexity, or constitute procedures for reducing multifaceted life experiences to a simplicity they never had. This is also a challenge for meta-analytical work, where

the process and products of our inquiries necessitate acts of remembrance, critical reflection, and interpretation, which perhaps include that it is a fiction that we sense remotely, or imag(in)e with a view from nowhere.

Notes

1 See N. Gough (1997) on how remote sensing techniques and images position people as "post-panoptic" observers rather than "intimates of the earth," and for an in-depth discussion of issues raised here. Further analysis of the implications and limitations of remote sensing can be found in critical discussions of Geographic Information Systems (Curry, 1998; Pickles, 1995).

2 It is noted that, in some circles, action research is discursively constructed to represent a panacea for resolving the problems of research, philosophy, and practice in education (www.actionresearch.net), which, one assumes, includes "subfields" like environmental education (cf. the critique of action research by Gudmundsdottir, 1991).

3 N. Gough (1999) suggests "results are the testimonies to the experiences of the *researchers* as they *produce* data, that is, they are the joint accomplishments of the subjects and the researchers" (p. 413). Despite their differences, while some qualitative reports may valorize the "exotic" and highly charged issues in the inquiry, much of the process of qualitative data analysis, like that of quantitative data analysis, pursues questions of significance and what will be privileged in the research narrative, alongside decisions about what will be forgotten, devalued, or left (out) as marginal.

4 This is not to suggest that the ultimate focus of research is other than humans (Smith-Sebasto, 2000), but to recognize that the professional basis of many environmental education researchers is located in the natural sciences, where positivistic appeals to the natural sciences as a model for social-scientific research are common (Gough & Reid, 2000), whereas the focus of the natural sciences, typically the earth, operates as the location of the "end" for which many environmental educators expect their work to bear fruit.

5 Possibilities include multicultural postmodern ecological worldview (Gough, 1991) and a multicultural ecology employing a actor-network theory (Ivakhiv, 2002), both of which offer frameworks that are less dependent on ontological distinctions between classes of actors or agents, for example, as found in biotic and abiotic actional networks within environmental research.

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References

Benton, L.M. & Short, J.R. (1999). *Environmental discourse and practice*. Oxford: Blackwell.

Britzman, D. (1995). The question of belief: Writing a poststructural ethnography. *International Journal of Qualitative Studies in Education*, *8*(3), 229-238.

Cantrell, D.C. (1993). Alternative paradigms in environmental education research: The interpretive perspective. In R. Mrazek (Ed.), *Alternative Paradigms in Environmental Education Research* (pp. 81-106). Troy, OH: NAAEE.

Connell, S. (1997). Empirical-analytical methodological research in environmental education: Response to a negative trend in methodological and ideological discussions. *Environmental Education Research*, *3*(2), 117-132.

Curry, M. (1998). *Digital places: Living with geographic information technologies*. New York: Routledge.

Denzin, N. & Lincoln, Y. (2000). *Handbook of qualitative research* (2nd Edition). Thousand Oaks, CA: Sage.

Dunlap, R.E., Van Liere, K.D., Mertig, A.G., & Jones, R.E. (2000). Measuring endorsement of the New Ecological Paradigm: A revised NEP scale. *Journal of Social Issues*, *56*(3), 425-442.

Eisner, E.W. (1997). The promise and perils of alternative forms of data representation. *Educational Researcher*, *26*(6), 4-10.

English, F.W. (2000). A critical appraisal of Sara Lawrence-Lightfoot's portraiture as a method of educational research. *Educational Researcher*, *29*(7), 21-26.

Environmental Education Research. (2000). Special issue: Qualitative methods of inquiry. *Environmental Education Research*, *6*(1), whole issue.

Eraut, M. (1985). Knowledge creation and knowledge use in professional contexts. *Studies in Higher Education*, *10*, 117-133.

Escobar, A. (1995). *Encountering development: The making and unmaking of the Third World*. Princeton University Press.

Fairclough, N. (1992). *Discourse and social change*. London: Polity Press.

Fairclough, N. & Chouliaraki, L. (1999). *Discourses in late modernity: Rethinking CDA*. Edinburgh: Edinburgh University Press.

Fien, J. (1993). Ideology critique and environmental education. In J. Fien (Ed.), *Education for the environment: Critical curriculum theorising and environmental education* (pp.14-49). Geelong: Deakin University Press.

Fien, J. (2000). Listening to the voice of youth: Implications for educational reform. In D. Yencken, J. Fien, & H. Sykes (Eds.), *Environment, education and society in the Asia-Pacific* (pp. 251-275). London: Routledge.

Foucault, M. (1973). *The origin of things: An archaeology of the human sciences*. New York: Random House.

Foucault, M. (1981). The order of discourse. In R. Young (Ed.), *Untying the text* (pp. 48-78). Boston: Routledge & Kegan Paul.

Foster, J. (1999). What price interdisciplinarity? Crossing the curriculum in environmental higher education. *Journal of Geography in Higher Education*, *23*(3), 358-366.

Garratt, D. & Hodkinson, P. (1998). Can there be criteria for selecting research criteria? A hermeneutical analysis of an inescapable dilemma. *Qualitative Inquiry*, *4*(4), 515-539.

Goodson, I.F. (1996). Curriculum contests: Environmental studies versus geography. *Environmental Education Research*, *2*(1), 71-88.

Gough, A. (1997). *Education and the environment: Policy, trends and the problems of marginalisation*. Melbourne: Australian Council for Educational Research.

Gough, A. (1999). The power and the promise of feminist research in environmental education. *Southern African Journal of Environmental Education*, *19*, 28-39.

Gough, N. (1991). Narrative and nature: Unsustainable fictions in environmental education. *Australian Journal of Environmental Education*, *7*, 31-42.

Gough, N. (1997). Weather™ Incorporated: Environmental education, postmodern identities, and technocultural constructions of nature. *Canadian Journal of Environmental Education*, *2*, 145-162.

Gough, N. (1999). Surpassing our own histories: Autobiographical methods for environmental education research. *Environmental Education Research*, *5*(4), 407-418.

Gough, S. & Reid, A. (2000). Environmental education research as profession, as science, as art and as craft: Implications for guidelines in qualitative research. *Environmental Education Research*, *6*(1), 47-57.

Gough, S., Scott, W., & Stables, A. (2000). Beyond O'Riordan: Balancing anthropocentrism and ecocentrism. *International Research in Geographical and Environmental Education*, *9*(1), 36-47.

Grün, M. (1996). An analysis of the discursive production of environmental education: Terrorism, archaism and transcendentalism. *Curriculum Studies*, *4*(3), 329-347.

Gudmundsdottir, S. (1991). Ways of seeing are ways of knowing: The pedagogical content knowledge of an expert English teacher. *Journal of Curriculum Studies*, *23*(5), 409-421.

Hannigan, J.A. (1995). *Environmental sociology: A social constructivist perspective*. Routledge: London.

Hart, P. (1996). Problematizing enquiry in environmental education: Issues of method in a study of teacher thinking and practice. *Canadian Journal of Environmental Education*, *1*, 56-88.

Hart, P. (2000). Requisite variety: The problem with generic guidelines for diverse genres of inquiry. *Environmental Education Research*, *6*(1), 37-46.

Hart, P. & Nolan, K. (1999). A critical analysis of research in environmental education. *Studies in Science Education*, *34*, 1-69.

Hopkins, C. & McKeown, R. (2001). Reorienting teacher education to address sustainability. *Environmental Education*, *66*, 8-9.

Hungerford, H., Peyton, R., & Wilke, R. (1980). Goals for curriculum development in environmental education. *Journal of Environmental Education*, *11*(3), 42-47.

Ivakhiv, A. (2002). Towards a multicultural ecology. *Organisation & Environment*, *15*(4), 389-409.

Jickling, B. (1997). If environmental education is to make sense for teachers, we had better rethink how we define it! *Canadian Journal of Environmental Education*, *2*, 86-103.

Lather, P. & Smithies, C. (1997). *Troubling the angels: Women living with HIV/AIDS*. Boulder: Westview/HarperCollins.

Lopez, B. (1998). *About this life: Journeys on the threshold of memory*. New York: Knopf.

Marcinkowski, T. (2000). The NAAEE workshop on developing guidelines for qualitative research in environmental education: An analysis of premises, processes and products. *Environmental Education Research*, *6*(1), 27-35.

Marsden, W.E. (1997). Environmental education: Historical roots, comparative perspectives, and current issues in Britain and the United States. *Journal of Curriculum and Supervision*, *13*(1), 6-29.

International Society for Photogrammetry and Remote Sensing. (2001). Available at www.isprs.org, accessed January 2001.

Palmer, J. (1998). *Environmental education in the 21st century: Theory, practice, progress and promise*. London: Routledge.

Payne, P. (1997). Embodiment and environmental education. *Environmental Education Research*, *3*(2), 133-153.

Payne, P. (1999). Postmodern challenges and modern horizons: Education "for being for the environment." *Environmental Education Research*, *5*(1), 5-34.

Peshkin, A. (2000). The nature of interpretation in qualitative research. *Educational Researcher*, *29*(9), 5-9.

Pickles, J. (1995). *Ground truth: The social implications of geographic information systems*. New York: Guilford.

Reid, A. & Gough, S. (2000). Guidelines for reporting and evaluating qualitative research: What are the alternatives? *Environmental Education Research*, *6*(1), 59-91.

Reid, A. & Nikel, J. (2003). Reading a critical review of evidence: Notes and queries on research programmes in environmental education. *Environmental Education Research*, *9*(2), 149-164.

Reid, A., Scott, W., & Gough, S. (2002). Education and sustainable development in the UK: An exploration of progress since Rio. *Geography*, *87*(3), 247-255.

Rickinson, M. & colleagues. (2000). Environmental education research in the UK: A response. *Research Intelligence*, *71*, 36-37.

Robottom, I. & Hart, P. (1993). *Research in environmental education: Engaging the debate*. Geelong: Deakin University Press.

Seale, C. (1999). *The quality of qualitative research*. London: Sage.

Schneider, D. (2001). *Remote sensing of the global environment*a Available at www.geo.mtu.edu/rs, accessed January, 2001. Michigan Technological University.

Smith-Sebasto, N.J. (2000). Potential guidelines for conducting and reporting environmental education research: qualitative methods of inquiry. *Environmental Education Research*, *6*(1), 9-21.

Stables, A. & Scott, W. (2002). The quest for holism in education for sustainable development. *Environmental Education Research*, *8*(1), 53-60.

Stanisstreet, M. & Boyes, E. (2000). Benefits of quantitative empirical studies for environmental education. In B. Horst & J. Mayer (Eds.), *State of the art of empirical research on environmental education* (pp. 39-51). Kiel Germany: Institut fur die Padagogik der Naturwissenschaften.

Stern, P.C. & Dietz, T. (1994). The values basis for environmental concern. *Journal of Social Issues*, *50*(3), 65-84.

Todorov, T. (1984). *Mikhail Bakhtin: The dialogical principle* (Trans. Wlad Godzich). Minneapolis: University of Minnesota Press.

Walker, K. (1997). Challenging critical theory in environmental education. *Environmental Education Research*, *3*(2), 155-162.