Developing Environmental Awareness through Literature and Media Education: Curriculum Development in the Context of Teachers' Practice

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Abstract

This project was designed to help teachers in differing national contexts develop approaches to environmental education influenced by the arts rather than the sciences and social sciences, adopting a theoretical perspective allowing us to see our environments as "texts" to be "read" and, consequently, reworked. Efforts were made to encourage teachers' own pedagogic reasoning by involving them in devising, as well as using, teaching materials. Subsequently, the Internet is being used as a vehicle to encourage more interactive exploration and development of the offered ideas. The work builds on that of Hart, reported in the first edition of the *Canadian Journal of Environmental Education*, and attempts to show that teachers can be drawn effectively into reconceptualizing their own practice in environmental education through active involvement in the development of curriculum materials.

Résumé

Ce projet vise à aider des enseignants évoluant dans différents contextes nationaux à développer des approches d'éducation relative à l'environnement (ERE) s'inspirant des arts plutôt que des sciences et des sciences sociales, à partir d'une perspective théorique qui nous permet d'appréhender nos environnements comme des « textes » à « lire » et, par conséquent, à retravailler. Les enseignants ont été invités à réfléchir sur leur propre pédagogie, en participant à la conception et à l'utilisation de matériel didactique. Subséquemment, on recourt à Internet pour encourager une plus grande interactivité dans l'exploration et le

développement des idées avancées. Ce projet, qui prend appui sur les travaux de Hart mentionnés dans la première édition du *Canadian Journal of Environmental Education*, tente de démontrer que les enseignants peuvent être amenés à reconceptualiser leur propre pratique pédagogique en ERE lorsqu'ils sont mis activement à contribution dans la conception de matériel didactique.

The project, "The Development of Environmental Awareness through Literature and Media Education," attempted to expand and explore the scope of environmental education by making use of processes and knowledge bases associated with arts education and by converging on issues associated with environmental ethics and aesthetics. It rested on a conceptualization of environmental education (EE) underpinned by a theoretical perspective that assumes it is valid to regard the environment as "text" that can be read, (re)created and reworked (Stables, 1996, 1997, 1998).

Extending the range of stimuli and disciplinary frameworks within which we conceptualize environmental education problematizes what we might accept as the "borders" of environmental education, that is, what it may entail or encompass, as in its content, method, philosophy, or pedagogy. It might also take us beyond our "received wisdom" about what it means for a child to be "environmentally literate," often predicated on notions of children learning about environmental crises and problems, as defined in purely scientific or social-scientific terms, and about the science involved in the causes and/or their supposed solutions (e.g. UNESCO, 1976, the Belgrade Charter [as opposed to UNESCO, 1977, the Tbilisi Declaration]: "EE should consider the environment in its totality—natural and man-made, ecological, political, economic, technological, social, legislative, cultural and aesthetic" [p. 3]). Consequently, in the following section we summarise briefly the arguments for regarding the environment as "text," and our conception of what it means to be environmentally literate in order to "read" (and write!) such text. We discuss how this theoretical framework resulted in the identification of five foci for the European project, and in the development, or evolution, of teacher materials, a process which is still in train.

Because the project represented a conscious effort to examine the exchanges issuing from the translation of theory into practice, we attempted to engage teachers fully in the process of transforming and reviewing the initial ideas in their classrooms. We were sensitive to the need for them to engage as fully as possible with their own pedagogic reasoning (Hart,

1996) if the ideas we were proposing and investigating were ever going to have construct, pedagogic, and catalytic value in terms of curriculum development (Fien, 1992). We give more details of this, and other aspects of the project, below.

Environmental Literacy

The theoretical work on which the project is founded is distinctive within environmental education literature in drawing its conception of environmental literacy from a disciplined attention to the "literacy debate" in language, literature and educational studies, and from an interest in the "linguistic turn" in philosophy and social theory. Other dominant conceptions of environmental literacy (e.g., Roth, 1992) are not grounded in this debate but simply appropriate the term "literacy" from an existing environmentalist perspective. The arguments for regarding the environment as text are made most fully in three previous articles by one of the authors (Stables, 1996, 1997, 1998). Essentially they rest on the following premises, all of which, we argue, can be validated from a range of perspectives:

- From the very fact of our naming of its constituent parts, and the passing on of those names through the generations, our understanding of environment is culturally determined (cf. Eder, 1996). (On a broader level, note the contested meanings derived from juxtaposing "nature" with other terms: "nature" versus "culture," "human nature" versus "nature as nonhuman," "natural" versus "artificial," and "nature" versus "nurture," Barry, 1999),
- Things which are named are "signs." According to the seminal linguist, Ferdinand de Saussure, language is a system of signs (Saussure, 1959). Saussure's work underpins developments in philosophy and sociology as well as linguistics and literary studies, notably structuralism and its departures, for example, in poststructural and postcolonial readings of environmental education discourse (Andermatt Conley, 1997; Duque Aristizabal, 1999; Kelsey, 1999).The "reading" of visual, as opposed to verbal signs is dealt with specifically under the discipline of semiotics (after the philosopher C.S. Peirce and Saussure's use of the term "semiologie"),
- Our interaction with the environment is thus one of semiotic engagement. To be environmentally literate is to be able to interpret the signs in our environments (often, but not exclusively, visual), at a number of levels; such interpretation is largely undertaken through spoken and

written language (cf. Soper, 1995), and

- With respect to this, it may be useful to think in terms of functional, cultural and critical levels of environmental literacy (Stables, 1998), just as these terms are used in the general educational debate with reference to reading and writing (e.g., Williams & Snipper, 1990).

According to this typology, *functional environmental literacy* will generally be seen as fundamental. It implies an understanding of the natural world, ecosystems, and topical environmental issues: the ability to understand our surroundings and the major issues relating to them in a derivative manner. For example, the functionally environmentally literate citizen will be able to name common flora and fauna and understand that (if not how) carbon dioxide emissions might contribute to global warming. Without some level of it, positive environmental action, whether predominantly instrumental, ethical, or aesthetic, cannot be undertaken. *Cultural environmental literacy* involves an understanding of the significance of, for example, particular places for others and within the dominant cultural practices of a society (see Hirsch, 1987). Although "cultural literacy" has been a contested term in the broader educational debate, particularly in the United States, with commentators placing differential emphasis on the relative importance of understanding culturally dominant or "other" perspectives, all users of this term stress the need to develop awareness of what others see as significant. For instance, with respect to the environment, it is important to have some feeling for the perceived importance of the countryside in terms of its aesthetic appeal and as a site for leisure in heavily built-up regions such as the South-East of England, or to be sensitive to public assumptions about National Parks (Ingold, 1992; Milton, 1996; Rennie-Short, 1991). *Critical environmental literacy* involves the capacity to engage in debate about environmental issues at an ideological and philosophical level, to "unpack" the text, and thus carries with it the possibility of effective and reasoned political action with respect to the environment. Critical literacy is essential for effective action (cf. Habermas's conception of critical emancipatory knowledge: Habermas, 1978) yet is impossible if not grounded in a good level of functional and cultural environmental literacy (Stables, 1998).

The Development of the Five Foci for the Project

Based on the thinking described above, five foci were developed for the intended project. They take the notion of "text" in two distinct ways: a "narrow" view of text as *authored human artefact* (verbal or visual) and a "broad"

view of text as *landscape and environment itself*. The five foci are:

1. The development of understanding of environmental issues through the study of literary and media texts

Much literature and media education has been concerned with the exploration of social issues. Developing response to text has thus been framed by reference to moral and other social issues of contemporary concern and of relevance to young people. Literary and media theory now valorises readings of texts grounded in particular ideologies or perspectives on social issues: hence Marxist criticism, feminist criticism, etc. There is less evidence of "Green" readings of texts, though there is now a body of ecocritical work (e.g. Buell, 1995; Stables, 1993; Morgan, 1997). Several literary and other texts with appeal for a wide range of European citizens have been explored, at least in part, with reference to environmental issues (e.g. Soetaert, Top, & Eeckhout, 1996). In this part of the project, the focus was on teachers provoking thinking and discussion of environmental issues as part of the study of both classic literary texts and media texts, such as feature films, reflecting a broad cross-section of European traditions.

2. The study of literary and media texts specifically concerned with the environment

Certain texts, whether fictional or factual, have been created specifically to air concerns relating to environmental issues. Such texts self-evidently include contemporary educational television broadcasts of a documentary nature, but embrace forms as diverse as lyric poetry and newspaper advertisements. Some (for example, some of Wordsworth's poetry, or much classical Greek and Roman verse), predate our (post)modern environmental concerns. Part of the work of the project has been to develop teachers' ability to address such texts critically, in order to enable students both to compare and contrast the treatment given to issues in differing texts and to evaluate such texts in terms of their effective handling of the issues.

3. The creation of literary and media texts relating to environmental issues

Effective teaching acknowledges that students learn through doing, and literature and media education have long accepted this idea (Britton, 1972; Masterman, 1985). This aspect of the project's work focused on providing help for teachers in enabling students to produce good quality texts about environmental issues, and helping them to evaluate their and others' work

critically. Such texts range in type from students' own poems and short stories to videos and urban and wildlife photography, and may be intended as primarily descriptive, emotive, or persuasive. We have also endeavoured to encourage the sharing and mutual evaluation of such texts among students in different countries.

4. The study of aspects of the environment itself as text

It is possible to adopt a very broad definition of text which incorporates, at the very least, crafted landscape features such as parks and gardens, and which, in its extreme form, can even be held to include purely "natural" landscapes (Stables, 1996). Part of the work of the project was to examine ways in which insights gained from literary and cultural theory can be used to create new teaching approaches in relation to environmental issues across Europe, based on models from textual studies and the humanities. These approaches can be used to complement existing ones taken from the physical sciences and geography (Gandy, 1996).

5. The re-creation and enhancement of the environment with reference to aesthetic considerations

As an extension of (4), the project examined ways in which environmental conservation, repair, and improvement can be carried out with reference to aesthetic considerations as well as to the notion of the environment as a cultural and social construct (Hannigan, 1994; Gare, 1995; Zimmerman, 1994).

The Development of Teaching Materials

In terms of the development of teaching materials, the mechanics of the project were straightforward. An invited team of teachers in each country (UK, Belgium, Portugal) would develop materials in dialogue with the project team, and these would then be formally trialled and evaluated by further teams of teachers (identified through a number of existing networks) before being presented, in textbook form, as part of the project report. However, we were concerned not to impose ideas "top-down" on teachers. Rather, as the project effectively asked for a paradigm shift in pedagogical thinking about environmental education, we wanted teachers to be actively engaged in the processes of rethinking their work, whatever their degree of prior engagement with the field. Teachers' own beliefs about learning will inform their thinking (Clark & Peterson, 1986; Day, Pope, & Denicolo, 1990; Day et al., 1993; Elbaz, 1990). We thus aimed to develop the work of the project so as

to allow as many teachers as possible to use their own pedagogical knowledge to create activities from the ideas which were appropriate for their own students (Shulman, 1986, 1987; Wilson, Shulman, & Richert, 1987).

Examples of the materials sent out to the schools are summarized below. Further examples can be accessed on the project website.[1] The materials were presented for teacher use and review in as open-ended a way as possible, using a series of prompts to stimulate teacher thinking as well as offering concrete suggestions for classroom practice and pupil activity.

Teacher Involvement

Prior work by one of the project team had already shown how elaborately ideas of this sort can be developed by committed teachers (Soetaert, Top, & Eeckhout, 1996). The teachers who worked with the new materials sent evaluative comments and further suggestions back to the project team. Details of these are available in the project report (also accessible via the project website), although examples are given below. Encouragingly, they refer to movement in their own, as well as their students', thinking. There is some evidence of teachers being made more conscious both of environmental issues and of the potential for the use of literary and other texts in environmental education, rather than confining environmental education to the science, geography and perhaps social studies curriculum. Teachers also reported that they learned from the enhanced insight into their pupils' understanding and perceptions. Several comments suggested positive learning outcomes for pupils, including becoming more observant, looking critically at their immediate environments, and developing their research skills (Stables, Bishop, Stoer, Lencastre, & Soetaert, 1998).

In terms of meeting the project's objectives, the responses received during the course of the project were encouraging, but only work over a longer period can show convincingly real changes in teachers' thinking and approaches to environmental education. Although the project was not funded on a longitudinal basis, we felt it important to embed literature and the arts more firmly into environmental education, and therefore developed the project website. This contains the ideas for teaching developed during the course of the project and also includes a discussion forum, effectively an electronic noticeboard for the exchange of ideas. We hope that over time this will be used by many teachers who will share their experiences of working with the ideas and suggested materials, whose work will generate new and ever improved ideas and materials. We hope, too, that at a more theoretical level, teachers will continue to discuss the premises of the project and

the potential for developing a stronger role for the arts and humanities within environmental education. It is in this way that we hope to show that our project has begun to have some effect on teacher thinking and practice.

Examples: The Process in Action

As we have indicated, the approach to offering guidance to teachers agreeing to trial the material was underpinned by the belief that it is not possible for teachers simply to deliver somebody else's ideas without being a party to the thinking. We believe that teachers will employ pedagogical approaches which are related to their knowledge and beliefs about teaching, and that it is likely that they will try to enact their theories of teaching and learning in their classroom practice. Acknowledging Hart's (1996) study, we wished teachers to develop a sense of coherence and consistency in their own thinking through the framework of the materials provided. Questions offered were therefore designed to encourage teachers to reflect on their underlying values and beliefs and to consider the influences which may affect their teaching. In this way we hoped that they would be better able to articulate their understanding of how children develop environmental awareness through the evaluation process accompanying the trialling of the materials.

Initially, groups of teachers engaged by the project were asked to develop ideas for activities relating to each of the five foci, and appropriate to different age ranges between 4 and 19 (see examples in Figure 1). In the spirit of the project, the contributing teachers were free to interpret the foci.

The ideas were given headings as follows:

- *for younger pupils (ages 4-10)*
  - Playground Development (UK)
  - Shape Poems (UK)
  - Biodiversity through Andresen's *The Sea Girl* (Portugal)
- *for pupils in the middle years of schooling (ages 10-14)*
  - Pictures of Bath (UK)
  - Views of Bath (UK)
  - Ecosystems, Cultures and Development in the Movie "Pocahontas" (Portugal)
  - Looking at Environmental Change (UK)
  - Drawing the Landscape: Landscape Painting and Childhood (Belgium)

- *for older students (ages 14-19)*
  - Macbeth (UK)
  - Ecology and Human Diversity in Torga's "Portugal" (Portugal)
  - The Symbolism of Sweet Water in Luis's "The Mother of a River" (Portugal)
  - Economic and Socio-Economic Aspects of Fishing Resources in Portugal (Portugal)
  - The English Landscape in Paintings (Belgium)

  (Details of each of the above can be accessed through the project website.)

This section will now look, in turn, at examples from each of the countries involved of how the theoretical perspectives outlined above were translated into practice. The UK and Portuguese approaches distributed paper-based materials to teachers whilst the Belgian team worked with a strongly interactive Information and Communications Technology focus, using the Internet throughout as the medium to communicate the materials to the teachers.

The three ideas chosen as representative exemplars for this paper are:

- In the UK - The Playground
- In Portugal - *The Sea Girl*

Country **Focus**	Portugal Focus 1	Belgium Focus 4	UK Focus 5
	The study of aspects of the environment itself as text	The study of aspects of the environment as text	The re-creation and enhancement of the environment with reference to aesthetic considerations.
Title (exemplars	*The Sea Girl*	"Drawing the Landscape"	"Playground"
Age range	6-10 year olds	10-13 year olds	4-7 year olds

- I n Figure 1. Examples from the three partner countries.

Belgium - Drawing the Landscape

As yet, the number of responses received in relation to ideas for older

students are small (though encouraging). For this reason, none of these ideas are discussed below.

In the United Kingdom

Focus 5 (*The re-creation and enhancement of the environment with reference to aesthetic considerations*) is designed to extend children's notions of the environment as cultural and social construct, and to encourage them in the belief that they can often improve their environments with respect to qualitative considerations such as beauty, in addition to promoting sustainability. In this simple activity for 4-7 year olds, the group of teachers lighted upon the "playground" as a safe area, which children might consider to be "their" environment, free to some extent from the interference of adults. Through discussion of their own experiences, children might then be guided to think of the playground as an environment which can be looked at aesthetically in terms of its positive and negative aspects, in terms of safety, and in relation to their ideals and their visions of the future (cf. other work on school grounds, e.g., Titman, 1994). Moreover, by stimulating the children to think about playgrounds as "environmental texts," they are encouraged to use speaking, listening, writing, and drawing skills which can lead the teacher to explore further their awareness of aesthetic considerations.

The material developed by the authors explains the rationale and then requires the teachers to consider some key questions to stimulate their own thinking. Amongst others, teachers were asked to consider questions such as:

- Where do young children get their ideas about the environment?
- What kinds of things do children value in their environments?
- How do you think young children begin to develop an understanding of the concept of environment?
- What experiences might they have which could be significant in this process?

To achieve the aim of facilitating ownership, teachers were first offered potential aims and anticipated outcomes for the activity before being asked to think about their approaches to teaching. Guidance was thus set out in two columns as in Figure 2. In the teacher thinking column, pertinent questions were asked to assist the teachers to think about their planning and

Teacher Thinking	Approaches to Teaching
Introducing the idea Asks teachers about the kinds of questions they think they need to ask their pupils	*Introducing the idea* Suggests the teachers elicit pupils' ideas and provide some form of visual stimulus
Class discussion Encourages teachers to ensure that pupils' visions emerge, not teachers' ideas	*Class discussion* Suggests a brainstom activity and to look for positive and negative questions
Design phase Encourages teachers to think about sharing strategies	*Design phase* Suggests some organizational strategies they might try
Feedback Asks teachers to bring out the creative and aesthetic aspects of what pupils have suggested	*Feedback* Suggests that teachers frame questions based on children's ideas to lead into the making phase
Making and exhibiting Points out that the realization is not necessarily the outcome	*Making and exhibiting* Suggests an exhibition or poster to allow pupils to express their feelings

Figure 2. Teachers' thinking and ownership.

designing of activities. Alongside, in the approaches to teaching column, practical guidance was given to help teachers "transform" the ideas into activities for teachers and pupils (Shulman, 1986).

Achieving a balance between guidance and direction is not a simple matter as teachers, according to their particular preferences, will respond in different ways. However, asking teachers to consider such questions prior to designing their own activities is consistent with the approach Hart (1996, p. 66) advocates. He argues that researchers should help teachers to develop personally and professionally by helping them to understand what underpins their thoughts and action. For instance, it is suggested that in the class discussion teachers draw on the pupils' visions rather than impose one of their own. Exactly how they should go about this, however, was left to the teachers to decide for themselves. Having considered some fundamental questions at the outset, though, it was anticipated that teachers would draw on their personal pedagogical knowledge to determine the

appropriate approach. Thus, we were attempting to provide teachers with a theoretically grounded framework that would allow them to establish ownership and custody in the longer term over the activities they design.

In Portugal

Focus 1 (*The development of understanding of environmental issues through the study of literary and media texts*) aims to encourage "environmental readings" of good quality literary, and other, texts. In this activity, developed by the Portuguese team for 6-10 year olds from the book entitled *The Sea Girl* by Sophia de Mello Breyner Andresen, the aim is to develop children's awareness of biodiversity by mirroring the relationship between a shore dweller and a sea dweller. The conversations between the boy and the sea girl, who feature centrally in the story, provide interesting starting points for a deeper understanding of the environmental issues arising from their differing experiences and their developing relationship.

Comparable with the UK materials, the Portuguese team posed some questions to engage teachers in thinking about the story and the potential images it might evoke in relation to the environment. They were asked to consider their thoughts about how children would respond to questions such as these:

- What does "the sea" mean for small children?
- What do small children value/not value about the sea?
- How do they see themselves as sea dwellers?
- Which sea dwellers would they like to have as friends?

Similar to the UK materials, potential aims and anticipated outcomes were offered to Portuguese teachers before they were asked to consider their approaches to teaching. Figure 3 shows the same two column format, although the headings adopted by the Oporto research team reflect the ownership they adopted in order to present the ideas to their participating teachers.

Teachers were again provided with non-prescriptive guidance through a well developed framework, but left to determine the actual nature of the activities for themselves through their personal pedagogical reasoning. In parallel with the UK team, it was anticipated that the participating teachers would consider their assumptions and values underlying their thoughts. In turn this would enhance their ability to express authentically their personal practical knowledge of children's developing environmental awareness.

Teacher Thinking	Approaches to Teaching
Introducing Asks the teacher to establish some of the children's experiential starting points	*Introducing* Suggests readings from the text leaving the choice to the teacher and the children
Development Suggests some general approaches to move the ideas on	*Development* Gives an example
Activities Reinforces the idea that no specific prescription is being offered	*Activities* Offers a range on suggestions which the teacher might use in line with the approach chosen
Assessment Indicates general issues about organisation	*Assessment* Suggests some general areas for assessment

Figure 3. Teachers' thinking and ownership.

Belgium

Focus 4 (*The study of aspects of the environment as text*) offers an opportunity for children to reveal their experiences of literature and various media through their landscape drawings. As children's perceptions of what constitutes the landscape will undoubtedly be influenced by their cultural background and environment, their drawings should offer some insights into their awareness of the environment itself.

"Landscape" as a cultural construct constituted the central theme of the work undertaken by the Belgian team. In this case, the developmental work was carried out using the Internet as an on-line educational environment for teachers. Using the Internet as a framework provided a quite radically different and distinctive form of engagement with the teachers, when contrasted with the paper-based approach adopted by Portuguese and UK teams.

Key questions that were put before the teachers prior to designing the activities were, for example:

- What would be the important elements in children's drawings?
- Which elements can tell us something about their perceptions of landscape?
- Which influences (social/family, cultural) may be crucial to account for

individual choices in pupils' landscape drawings?
- Which assignments, with regard to children's drawings, will give you the most appropriate results to work within group discussion?

Having oriented the teachers to develop their thinking about how social and cultural influences may impinge on children's ideas, they were asked, in their own ways, to develop creative opportunities for pupils to develop an awareness of their own perceptions of landscape. Typical of the approach, the teachers were provided with images of landscape drawings to stimulate both their, and their pupils', ideas. It was suggested that the teachers consider what further landscape stimuli would be appropriate and offered the University of Ghent website as a source of ideas (see http://simsim.rug.ac.be/landschap). Furthermore, pupils were encouraged to use computer software, for example image editors, to compose their ideas and text editors to add descriptive captions. Teachers were further asked to consider posing pupils with juxtapositions of stereotyped classic rural and urban landscapes in order to expose the cultural tensions that underlie many contemporary media representations. As a result of this process, the pupils' output could be captured as a "virtual art gallery." An advantage of working in this way is that all pupils' texts can be presented on screen and they can read what others have written

The kinds of questions indicated, as stated under the bullet points above, were posed in order to make more explicit for the teachers the relationship between their thinking and their actions in practice. Although the approach centred around sets of images determined initially by the Belgian team, teachers had the freedom to engage with those images and present them to the pupils in ways they reasoned to be appropriate. Having earlier considered some underlying questions relating to the development of children's environmental awareness, teachers are thus encouraged to inquire actively into the reasoning driving their actions.

Initial Responses from Teachers

As indicated above, the evaluative comments received from teachers (which are summarised more fully in the project report) were of interest both in terms of the views expressed by the pupils and, to some extent, in terms of developments in their own practice. For example, the suggestion by one of the respondents that "not only scientists should have responsibility for their environment," was congruent with the main thrust of the project: the kinds of attitudes we are trying to foster in teachers are those that

recognise or acknowledge that environmental awareness can be promoted by means other than science. Other respondents, who had not previously considered using children's own experiences and perceptions of the environment, admitted surprise when children looked critically at their local playground provision. Encouraging feedback was received in respect of the teachers' perceptions of the pupils' learning, inspired by imaginative use of texts in relation to a number of the trialled ideas. The activities chosen followed some of the suggestions indicated in the guidance material, but clearly the children had other ideas too, which our respondents said led to some noteworthy learning outcomes.

In particular, it should be noted that the teacher feedback suggests that engagement in the kinds of activities promoted by the project materials also led to some significant unanticipated actions related to the environment. These actions were akin, to some extent, to the concept defined by Jensen and Schnack (1997) as *action competence*. Action competence encourages pupils to become qualified participants, able and willing to take environmental action in a democratic context. In one instance, pupils were engaged in rethinking how a particular kind of house, described in the text, might be built to take account of the mobility of the sand dunes. In another, models and paintings were used in a dramatization to illustrate environmental issues as part of a school exposition. A form of action competence was perhaps displayed most visibly when pupils made contact with local authorities to co-operate in collective social actions leading to a more sustainable use of water.

Although some responses by teachers led us to believe that aspects of the materials were optimistic in their aspirations, the majority of responses from participating teachers showed an active reworking of the ideas, indicating that these teachers were beginning to take ownership of the pedagogy. From this, we infer that the approach can be considered a promising avenue when teachers can be seen to take custody of the rationale and develop and tailor activities to match their pupils' capabilities.

Concluding Remarks

It is very difficult to measure impact on teachers' practice generally other than by surveys on a large scale. It is still more difficult to measure the impact of a specific theoretical perspective on the practice of teaching. What is clear is that for "theory" to become "practice" (or to be constructively embedded within in it, if we accept the "reflective practitioner" account derived from Schön, 1983), more than the simple provision of new teaching materials may be required. In this case, we needed teachers

to engage with an idea that many of them might find alien: that the "real world" can be treated as "text," and that, therefore, there is more to becoming environmentally literate than they might have imagined.

Hart's (1996) study was driven by a desire to create conditions for teachers to engage in critical reflection in order to hear their voices, as it were, from "inside out." As it turned out, he was: "disappointed by the reluctance of teachers to expend time and effort required to construct their own written narratives" (p. 73). We, too, are concerned that we need to hear the teachers' voices. Bearing in mind lessons learned from Hart's study, we focused our approach to concentrate on providing a theoretically driven framework, drawing on research from environmental education and teacher thinking, which would help teachers "get inside their own heads" (p. 72) and allow us to gain an authentic expression of their practical pedagogical knowledge of environmental education.

To date, we have received some initial, and largely encouraging, feedback from teachers through the evaluation process, but not enough to draw any conclusions about whether we are bringing theory and practice closer together. We believe, however, that this is the beginning of an ongoing process whereby the interaction of teachers and researchers based on the development of the materials, ought to lead to a better understanding of teachers' thoughts and action with respect to environmental education.

A discussion forum is now on-line on the University of Bath website. Through the provision of simple on-line access to the materials, we are aiming to encourage teachers to engage in participatory action inquiry which, as a result, could help teachers to articulate their tacit knowledge. Elbaz (in Day et al., 1990) argues that teachers' ways of knowing and thinking often have an intuitive, non-linear, tacit, and incomplete nature; they appear to be at the centre of thought and action, and therefore should be a major focus of teacher research. We believe this project presents an opportunity to establish such a research focus and begin to understand more about how researchers' knowledge of environmental education interacts with practitioner knowledge and plays a part in informing teachers' thoughts and actions.

It is much too early for us to be able to claim any great advances with a significant number of teachers. What we feel we have been able to do is engage teachers in the *process* of adding a new conceptual dimension to their teaching. We have had some initial success in this with teachers at several levels and in three European national contexts. We further believe that the new technologies provide the means to encourage this kind of work on a much broader basis, and that this potential has so far been under-utilised in curriculum development. We invite readers of this paper to join us in con-

tinuing this developmental process.

Notes

[1] Website <http://www.bath.ac.uk/Departments/Education/eu/materials.htm>

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