

# YOU CAN TAKE A HORSE TO WATER... ENVIRONMENTAL EDUCATION THEORY AND PRACTICE IN THE CONTEXT OF A SIMPLE FRESHWATER ECOLOGY EXERCISE

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## SUMMARY

This article deals with some important considerations which should be taken into account in the planning and execution of environmental education activities. It questions the educational benefits of teaching and learning that rely on the transmission of information, and explores an alternative epistemological basis for such work.

It suggests that a discussion-based approach focused on experiences of actual environmental issues, encountered problematically, should characterise environmental education activities.

A simple ecology exercise dealing with organic pollution of a river is provided as a context for the educational principles and ecological concepts which are described.

## INTRODUCTION

Just as one cannot make a horse drink, so also can one not make people adopt different values or lifestyles. It is thus important for environmental educators to work through and overcome what O'Donoghue, in a survey of ecology fieldwork carried out during excursions, identified as a problem, that 'most environmental education activities ... were based on crude and conflicting assumptions about teaching and learning' (1990, p. 21).

It is widely accepted that learning is not merely a cognitive phenomenon; an emphasis on the transmission of facts is a position that has long been rejected (Aho 1984, Carr and Kemmis 1986). Unfortunately, however, this approach still characterises much of what takes place in schools in South Africa. In environmental education many have called for equal, if not greater, attention to be paid to attitudes, values, ethics and actions (Ballantyne and Oelofse 1989, Clacherty 1988, Horwood 1989, Hurry 1982). In this paper a further call for a more critical understanding of this area is made.

Bearing this in mind, how can a teacher deal with environmental activities in a methodologically acceptable manner? A 'top down', instrumentalist approach is not seen as a suitable theoretical position on which to base practice as it does not acknowledge that understanding should emerge in context and that meaningful learning is active or reconstructive on the part of the learner (Berger and Luckman 1967).

To take the present case, not only should the facts associated with freshwater ecology and pollution be balanced with an appreciation of social values, economics, ethics, aesthetics and so on, but to present such material as a package-to-be-adopted is unlikely to result in truly effective learning. Consequently, the restructuring of meaning and actions is likely to be of limited extent or value. An alternative epistemological basis for teaching must be explored.

## AN ALTERNATIVE EPISTEMOLOGICAL BASIS FOR ENVIRONMENTAL EDUCATION

In environmental education much emphasis has been laid on values, ethics and action. Values education has received particular attention. There has been a valid desire to examine the links between attitudes, values and behaviour and to tighten these where possible. However, such work has generally not been successful and it is now acknowledged that to assume causative links between behaviour, attitudes and values is simplistic (Boyd and Bogdan 1984, Deaux and Wrightsman 1984). Much of this sort of work has adopted an excessively deterministic stance, both from a psychological, as well as an educational perspective and recent educational developments (Carr and Kemmis 1986) highlight this as the fundamental flaw in attempts to 'teach for attitude change'.

This article is an attempt to explore an alternative approach to this issue in the context of a simple case study, to be presented below. It assumes that understanding emerges from a dialogue with one's world of experience and with significant others; learners must be led into a direct experience of the learning context and in that context become able to examine their own understandings and restructure these in such a way that they are able to 'conceive of things as being otherwise than they are' (Greene, in Bakker 1985, p. 133). This theoretical position is exemplified in the work of, for example, Carr and Kemmis (1986), Greene (1973, 1978), Novak and Gowin (1984) and Stenhouse (1975).

It was useful in the case study ecology exercise, to consider and apply principles which had already been derived in environmental education within the basic paradigm already described (Clacherty 1988). It has been found, for example, that experiencing other people's ideas and opinions, and being exposed to a variety of possibilities from which unrestricted, subjectively relevant choices can be made, allow

learners to explore issues about values and come to enhanced understanding.

However, merely presenting individuals with the 'opportunity to reconsider the beliefs and attitudes inherent in their existing ways of thinking' is not sufficient, since it 'ignores the fact that conceptual changes do not occur simply because one interpretation is more rational or correct than another' (Carr and Kemmis 1986, p. 91 and p. 97). It is thus necessary to go beyond merely presenting and to confront. Schutz (1967) uses the term 'shock', which entails the learner challenging his or her basic assumptions.

This can occur in situations where participants are required to adopt roles or articulate basic theoretical positions with which they would not normally have associated themselves (Clacherty 1988). The effect of such a challenge to existing loyalties is a breaking away from own beliefs, attitudes or values and growth in an appreciation of the multifaceted nature of the issue being considered.

Since environmental problems are the outcome of social processes, 'a consequence of political and economic decision making' (Gomm 1978, p. 63), such a breaking away should lie at the heart of environmental education. Environmental educators must, therefore, with Greene, associate

knowing with a type of participant action or with engagement in problematic situations ... few conceive knowing as passive or merely contemplative (1973, p. 121).

Simply stated, the above principles require that the educator should act as a facilitator, not only producing information, but providing experiences in which learners come to confront their own understanding. The educator should encourage the free emergence of divergent views which should be discussed and challenged, not necessarily by direct verbal confrontation, but through interaction with the experienced context.

The rest of this article deals with a case study in which standard 6 students participated in an ecology course at an extra-curricular education centre. The principles and issues raised above formed a theoretical base for much of what took place on the course.

## THE ECOLOGY EXERCISE

In line with the stated theoretical position, participants were not summarily informed that they would be conducting a pollution survey of a stream. Instead, the topic arose from an earlier visit to an urban field centre, which included work on a nearby stream. Issues discussed included human rights, health and safety (a group of homeless people had established shelters on adjacent, open land), and environmental degradation. From this base, and taking into account the available resources, the focused study described below was

adopted as a means of providing a context for experiencing specific aspects of the topic first-hand.

The description is presented in a formal, or routine, manner and no attempt is made, initially, to link it with the theoretical issues which informed its use. This is deliberate, in that it illustrates, up to a point, the dictum 'It's not what you do but the way that you do it.' In other words, the alternative epistemological basis for environmental education which is called for in this paper does not necessarily require an entirely new set of fieldwork exercises or worksheets (although these are emerging in South Africa). Rather, we can proceed, initially with what we have, but by means of an alternative approach.

The ecology exercise is based on a Wildlife Society of Southern Africa publication (Everett 1980) and took place on the Sandspruit, a tributary of the Jukskei, Crocodile and Limpopo rivers. The description of the exercise is followed by a discussion of how it fits into the overall educational approach used.

The particular site chosen for the exercise is in Wendywood, Johannesburg, at the end of Luderitz Road. Sampling took place according to the instructions provided by Everett (*ibid*) in a stretch extending 70 m downstream from the weir. While this site has no intrinsic importance, its exact location is recorded so that follow up studies may be undertaken.

## Procedure

Sampling sites of about one square metre in extent were selected within a riffle zone. Nets constructed from wire coathangers and old stockings were used to collect samples. These were obtained by overturning rocks with a broom handle and disturbing the chosen sites, so that any animals which were clinging onto pebbles or sheltering under rocks were dislodged.

All material which washed into the net from the sampling sites was collected and transferred to inspection trays. We used baking trays which were found to be a little shallow, but a white plastic Tupperware-type container about the size of an A4 page and about 5 cm deep would be ideal. Simple hand lenses were used for identifying animals in our samples. By means of the identification aids provided by Everett (1980), a species composition of the animals sampled was built up. Some warnings are necessary. Firstly, it is likely that *Bilharzia* will be present, unless you are sampling in a mountain stream. Direct and prolonged contact with the water should thus be avoided. It is suggested that indemnity forms be used.

It is also recommended that teachers practise collecting and identifying samples on their own. While the procedure is simple, one can be caught out when many organisms are collected which are not in the identification key. However, to enhance the process of

close observation and to promote the experience of scientific discovery, specimens that are not identifiable from the key should be sketched and described for later identification. The key consists of a selected group of indicator species common and large enough to be fairly easily identified: it is not intended to be an exhaustive list of organisms which may be found in an aquatic ecosystem. For this reason one does not have to be a well trained ecologist or biologist to make use of this exercise, although such expertise is likely to enhance the value of the exercise for pupils. The exercise, which was conducted in late October, yielded the results shown in table 1.

**Table 1: Sampling results**

	Number of Individuals	Percentage
Mayfly ( <i>Baetis</i> ) nymphs	22	18,0
Stonefly nymphs	1	0,8
Blackfly larvae	1	0,8
Midge larvae	76	62,3
<i>Tubifex</i> worms	21	17,3
Leeches	1	0,8
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	122	100,0
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The community as represented by the results shown in the table is dominated by midges (i.e., more than 50% by number). This suggests that the water quality, on a 5-point scale from 1 (good) to 5 (very bad), is 3, or poor (Everett, *ibid*). This particular sample is interesting in that it contains almost equal numbers of mayflies and *Tubifex* worms. Mayflies are indicators of water with an abundance of oxygen and hence of unpolluted conditions. In the case of *Baetis* species of mayflies small amounts of pollution can be tolerated. *Tubifex* worms on the other hand, are associated with low oxygen levels in water and are thus indicators of polluted conditions. However, since *Baetis* are not easily able to survive polluted water, it appears that the water quality in the study area is better than might be inferred from the presence of *Tubifex* worms in the sample.

While it is possible to separate out a number of species within each of the above categories and to obtain an accurate assessment of water quality from the detailed tables provided by Everett (*ibid*), the results presented in table 1 are adequate for the present (educational) purposes.

A general conclusion that can be drawn from the above is that the degree of organic pollution in the river has caused oxygen depletion to the extent that many of the more sensitive organisms in the river are unable to survive. To the extent that any organism is part of a greater whole, it is clear that other organisms, on both micro- and macro-scales, are also experiencing some sort of stress.

## Emergent ecological concepts

The following ecological concepts emerged from the exercise:

- species diversity
- species dominance
- ecological balance
- modification of habitat
- nutrient availability and limiting factors.

These concepts will not be discussed here: they are well known and are represented in most ecology texts, for example, Clapham (1983), Kormondy (1976) and Odum (1971). What is of greater significance in ecological terms is the fact that the concepts are not habitat-, ecosystem-, or situation-specific. In the short ecology course in which the above exercise was used, these concepts, and in particular, the issues of habitat modification and resultant changes in species diversity and dominance, formed an ongoing theme, and were explored in a variety of ways and ecological contexts.

For example, an exercise based on a comparison of bird populations in a fairly natural area and in a highly modified environment illustrated the concepts perfectly in an ecological context which was entirely different from that of the water quality exercise.

## THE RELATIONSHIP BETWEEN THEORY AND PRACTICE

The above represents the content, or facts, of the ecology exercise. In a sense, this content could be described as ideologically neutral (insofar as this is possible at all), since it could have been dealt with deterministically or problematically, according to the persuasion of the educator. Expressed differently, the point can be made that even the best educational resources do not guarantee good education. They can assist and, to an extent, influence the nature of practice, but will be used as the user determines. The question thus arises: "How does the ecology exercise reflect the previously described theoretical perspective?" or "What way did this perspective inform practice?" It might appear at first that there can be no compatibility between the two. However, an examination of some key concepts reveals otherwise.

Shor promotes the notion of a situated pedagogy, where the learning process is situated in the actual conditions and context of the learners (Freire and Shor, 1987). While this view emanates from an emancipatory pedagogical context, where social and political issues interlink with oppressive conditions, it is applicable, pedagogically, to the study of ecology.

In this case study the learning experience is 'situated' in that it emerged from a previous excursion, as described earlier. This previous excursion took place within a

suburban context that was familiar to the students. It became problematic for them in that they made attempts to understand why environmental degradation was occurring and to reconcile existing prejudices to the obvious need for shelter and a stable lifestyle for the group of people that had established informal shelters along the river bank.

Likewise, the ecology exercise took place in the same familiar context, yet issues were encountered problematically. Situatedness is evident in the fact that by virtue of their own membership of society, the students were themselves implicated in the problems being encountered. This also reflects an application of the concept of shock, referred to earlier.

Carr and Kemmis (1986) describe the importance of praxis in a critical pedagogy. Praxis is defined simply as 'informed action' (p. 81) which results from one who 'plans thoughtfully, acts deliberately, observes the consequences of acting systematically, and reflects critically on the situational constraints of the strategic action being considered' (p. 40).

Reflecting critically on action seems, then, to be a hallmark of a critical pedagogy; its applicability in a situation such as the ecology exercise is demonstrable. For example, in the same way that the ecology exercise emerged from reflection on previous action, so issues and concepts which emerged were subjected to critical discussion. Thus, questions were discussed such as "Who is causing this pollution?"; "Who is responsible for dealing with the problems?"; "Who should bear the costs of environmental damage?"; "Should we accept this damage?" and "Why is it that pollution seems to be an inevitable part of modern life?"

As a result of such discussion, in which the facilitator encouraged an exploration of issues in terms of their many and wide-reaching implications, participants were able to come to an understanding that a study of environmental issues is as much a social, economic or political pursuit as it is biophysical. Moreover, since the ecology exercise was 'situated' for the students, they were able to appreciate their own complicity in the matter, and to see ways of acting for change.

Put simply, the exercise was first encountered experientially and only then subjected to analysis, or reflection, within a context of dialogue. Such a sequence implies that no answers were given; rather, questions were asked. The educator acted as a problem poser and the students as problem solvers.

The ecological concepts, although presented in the previous section in rather sterile and ordered scientific terms, were thus indeed 'emergent'. They began within an experience, were formulated in students' attempts to answer questions, and gained structure and formality in later discussion. Learning was not confined to ecology alone, in that it acknowledged the wider context of the exercise.

## CONCLUSION

The ecology exercise described in this article, while simple, can make a valuable contribution to river studies in South Africa. It takes attention away from obvious, but superficial forms of pollution such as littering, and focuses it on more environmentally significant and insidious forms of pollution.

Nevertheless, it is not suggested that environmental education activities focusing on litter are inadequate. Rather, this article gives support to a particular approach to such work which, it is believed, makes great educational sense. It suggests that much environmental education informed by a top down or 'social engineering' perspective of education has failed to achieve what it might have, and proposes an experiential, participatory and discussion-based epistemological framework as an alternative.

In this way the sort of ecology exercise used here is encountered problematically and not as a given. 'Facts' become issues, thereby encouraging a critical awareness of what might otherwise remain hidden, and probably false, assumptions. Accordingly, environmental education informed by such an approach is believed to be capable of addressing environmental degradation at its core, since it allows people to reconstruct the way they see the world.

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