From ecological science to environmental education: A professional turning point?

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Abstract

This article explores the significance of a shift in young people's professional career from ecological science to environmental education. The article reflects on the role of higher education in addressing social and political issues in environment and sustainability, and then provides an account of a course on environmental education research methodology at the Universidad Nacional Autónoma de México. The course included participants with an academic and professional background in ecological science who were seeking a change in profession to that of environmental education. It became clear that a shift in profession entails the exploration of an alternative professional philosophy. We draw on some of the participants' written biographical testimonies to identify some themes around 'professional turning points' and conclude that at least for some participants, there is a tension between science education that encourages 'an aspiration to be objective' and environmental education that encourages an 'aspiration to respect the subjective'.

Introduction

In our experience trained ecologists often reach a stage in their career when they contemplate a change of career, and many have come to us with an interest in entering the field of environmental education or education for sustainability. But are they conceptually prepared to for such a career change? With what epistemological and methodological tools has a training in biology invested them, and how do these relate to their prospective new professional role? For example, do they have an adequate conceptual basis in social science research? Do they possess an adequately holistic view of the relationship of science with other disciplines?
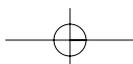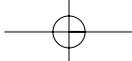
In our view, the blending of social and the natural sciences is of crucial importance, especially for the training process of higher education students in environmental education. A relevant question for higher education would seem to be "What theoretical and practical elements should be possessed by a young university student with an interest in environmental education as a profession?"

In the field of environmental education it is increasingly acknowledged that it is limiting to talk about environment and sustainability without taking into account the relationship of science and society. Environmental issues are tightly linked with political, economic and social issues (Barraza, et al., 2003; Robottom, 2003). In fact, Goffin (1998) defines the environment as an eco-socio-system, where there is an interaction between its biophysical and social aspects. Ecologists whose professional knowledge is restricted to the biophysical, with little or no consideration of the social elements of environmental issues, may bring a partial and limited view to the task of resolving environmental issues around them (Robottom, 1983).

This position has further philosophical implications. Changing fields from ecological sciences to environmental education is not just a matter of creating an alternative package of vocational tools – it requires a deeper professional and philosophical (epistemological and ontological) alternative. It has to do with our conceptions and ideas about research, our beliefs about knowledge and reality, our view about the world – in short, our situated political theory. Historically, views on this topic have changed.

Science in the XV and XVI centuries was possible essentially because of the static conception of the world that dominated the thinking of humanity (Filstead, 1997). Realism and logical positivism were elements of the dominant science paradigm of that time. One belief was that it was possible to understand the world largely, directly and accurately through the senses of human beings. During the XVIII and XIX centuries the idealists recognised the existence of a physical reality but argued that constructions of the human mind were the starting points of knowledge. They believed the social world was created by the individuals that lived in it (Filstead, 1997).

It can be argued that in the XX century, the education system in general was more interested in teaching than in how learning took place. We now believe that we cannot engage in critical education concerning environmental issues if we do not pay attention to how students are learning and what are they learning. The rise of the educational discourse of constructivism is evidence of this shift. If looking after the environment requires fundamental changes in different areas of life and human organisation, what sort of changes in education and learning are also required? Underpinning this question is the widely recognised idea that
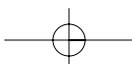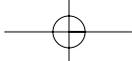
environmental education has not necessarily worked towards sustainable development and that instead it might be working for unsustainability (Barraza, et al., 2003), basically because the educational model (at least in Mexico) is still organised on an instrumentalist model.

Some authors addressing this question for the XXI century suggest that reconciling nature and society will require new combinations of knowing and learning, permitting different social actors to work in concert, despite the current context of much uncertainty and limited information (Kates, 2001). Ceccon and Cetto (2003) point to 'the imperative of holistic, transdisciplinary approaches when dealing with ecosystems, human and social systems, and their interactions... a question of essentially an epistemological and methodological nature [which] illustrates an important aspect of the kind of change that is needed in science itself'. But how can science and society change together, and what is the role of education in such change?

In order to answer these questions Sterling (2001) pointed to the need to understand the nature of educational paradigms as a prerequisite for attaining any changes in education, and argued that the legitimation of environmental education in the educational mainstream is a first step in achieving reformation and transformation of the educational system itself at the micro-level (that of educational institutions) and at the macro-level (that of policy development and implementation). As a specific example in the field of forestry Kentish (2004), in a major study of university-level forestry management courses in Australia, argued that courses with largely biological/ecological content and overall conceptual framework are actually ill-matched to the task of preparing professionals such as foresters for dealing with forest management issues – issues that are more social, economic and political than scientific in nature. In a similar vein, Ceccon and Cetto (2003) state that "the epistemological, methodological, organizational and institutional changes that need to take place for science to respond to the challenges of sustainable development, is a matter of serious consideration for the higher education system". In a sense, it would be almost irresponsible these days for a postgraduate course in environmental sciences not to include a consideration of the social and political nature of issues in environment and sustainability. It is from this conceptual position that we now turn to a practical instance of environmental education in higher education.

A course on environmental education research methodology at UMAM, Morelia, Michoacàn, Mexico

The Laboratory of Socio-Environmental Education Research at the Centro de Investigaciones en Ecosistemas of the National University of Mexico
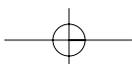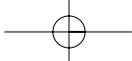
(UNAM), Campus Morelia, carried out a course for postgraduate students of the ecological science programme in November 2003. The course engages both theory and practice relating to the topic of "Educational research applied to ecology" and is of 60 hours duration. The course is presented each year and is perhaps one of the few ecology courses in Mexico that includes a study of socio-environmental aspects at the postgraduate level.

Most of the students participating on this course are biologists or have similar natural science backgrounds. The course on "Educational research applied to ecology" has adopted a systemic approach to education (Sterling, 2001) that emphasises:

• systemic rather than linear thinking
• integration rather than fragmentation
• processes rather than objects
• dynamics rather than cause-and-effect
• patterns rather than specific details.

An important challenge in this course was to achieve a balance between theory and practice – we wanted to avoid a course that was dominated solely by theoretical considerations. The general goal of the course was to offer participants the basic theoretical, methodological and practical tools to be able to work within the field of environmental education. Specific goals were:

• To review the development of the field of environmental education
• To acquire a general perspective on educational research applied to the environmental sciences
• To acknowledge the importance of doing research within the field of socio-environmental education
• To exemplify some research methods within socio-environmental education
• To use some qualitative and quantitative evaluation techniques (including interviews, content analysis, and systematic observation).

The course is full-time and looks for constant participation of the students. Discussions on theoretical and methodological research issues are based initially on a selection of readings. There are individual as well as group exercises, but most importantly there are practical activities encouraging students to explore ways that theories and practices relate to each other in communities of inquiry outside the formal institutional context.

We will now draw upon the experience of course participants in discussing the motivations, interests and justifications relating to the 'professional turning points' encountered by such students as they undertake professional development linked to their changing fields of interest. We will also consider some of the intellectual (epistemological and ontological), political, ethical, and
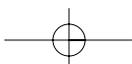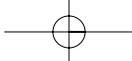
practical dilemmas that emerge as a consequence of the fact that these participants are contemplating a movement from one professional field to another. Finally we will mention the kind of support that students report that they require at this time of professional development.

In order to gain perspective on the 'professional turning points' encountered by students in the course, we invited them to maintain diary notes throughout the course and to compile a brief 'testimony' at the end of the course. We will be drawing on the perspectives reported in these testimonies in our discussion of 'professional turning points'.

In terms of academic background, most of the students reported a background in ecology. The remainder had backgrounds in the following fields: food engineering, environmental sciences, veterinary and business management. Most students described their main motivation for seeking to work in the field of environmental education as concern about the role of education in environmental improvement. Another fundamental motive was the desire to establish contact with people, so as to value people's interests. A majority of the students mentioned that a desire to contribute to the solution of environmental problems in the community was motivating them to work towards environmental education.

For a few, curiosity was their stated motive to work in the field of environmental education. This concurs with research by Mata (1998) it was found that a common feature that biologists identify about themselves is 'their passion for life' - their interest in searching and researching about everything that has to do with life itself. This expresses itself as curiosity and sense of adventure for field work. On the other hand, it is a characteristic of science education in Mexico (and perhaps elsewhere) that the emphasis is on scientific content and on the acquisition of correct information ('knowing the facts') – that is, on the cognitive rather than affective domain.

In other outcomes, students mentioned that as ecologists they feel the need to receive in their training basic tools to learn how to conduct environmental education research. They also indicated that this learning needs to be expanded towards postgraduate level, mainly because the resolution of environmental problems was seen as requiring a more integrated approach involving forms of inquiry from both natural and social sciences. Another justification advanced by students for deciding to work in environmental education was a perceived opportunity to engage in collaborative planning of a better future – an interest in the idea of environmental and social sustainability.

To illustrate these points, we present here a number of extracts from students' responses to the question "What intellectual (epistemological, ontological),
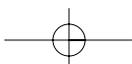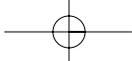
political, ethical and practical dilemmas do you see emerging as a consequence
of this change of fields?"

"One of the implications of changing fields was to start searching and reading for new
literature about social and political issues within the environmental dimension".

"I have confronted myself with a new pedagogical language, learning theories, didactic
strategies and different paradigms".

"As a biologist myself it is a challenge to work on environmental education because I
need to learn a different approach. From being positivist I now need to be critical and
learn from the subjectivity of others".

"I have seen the difficulties of being consistent when applying environmental
discourses in national and world projects; Also, how political interests and other
different conflicts can reduce and limit the transformation processes".

"In most cases politicians and decision makers have no idea about how to connect
environmental education to the new paradigm of sustainable development".

"From my experience I have learned the importance and the need to work
continuously with a community".

"I have been thinking a lot of who I am, and how I am relating to others. In this
process I have recognized how in some cases with my attitudes my perceptions or my
beliefs I can facilitate a learning experience, but also how in some others my capacity
to help is limited".

"I have learned to be flexible and tolerant, and realize that working with human beings
is different and complex (in time and space)".

"I have recognized the importance of training, but most importantly to recognize my
limitations (qualities and skills)".

"One of the important things that I learned when concluding the thesis of my
bachelor's degree, was that environmental education is not only about developing
educational programs. Previous research is needed in order to know people's
interests and to get them involved".

"In ecological studies when proposing strategies for conservation, in most cases, they
do not contemplate the inclusion of the society as an important part of the strategy.
I deeply believe that it is only through environmental education that we can have a
better world".

Conceptual tensions between academic training in disciplinary biological science and environmental education as a profession

Emerging from these testimonies is a degree of self-awareness among course
participants that they were at a significant turning point in their professional
careers. They could see that there are some deep philosophical differences
between biological science and environmental education as professions. These
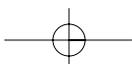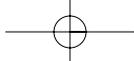
perspectives relate to the growing support in the literature for the view that environmental education is about the educative exploration of environmental issues, and that these environmental issues are necessarily value-laden, and perhaps more social than scientific in character (Robottom, 2003). These perspectives suggest that environmental education is not a case of ecology education, either in relation to substantive content matter or as a procedure:

«Just as the environment is not a synonym for nature, social-environmental conflict is not the same as an environmental problem; an environmental crisis is not synonymous with ecological imbalance, and *environmental education is not the same as teaching ecology*» (Layrargues, 2000 - our emphasis).

Rather than being seen as resolvable through recourse to ecological principles (and biological science more generally), environmental problems are being perceived as multi-disciplinary:

«Awareness of environmental problems is social awareness rather than ecological awareness. Such problems will be solved through collective action aimed at eradicating the social and economic causes of the degradation of the human environment» (Vidart, 1978).

«One of the fundamental qualities of environmental education that has emerged is that issues related to the environment have economic, cultural, aesthetic, political and spiritual dimensions, as well as scientific and technological ones. This has been a particular challenge to any educator or those that plan the curriculum» (Gayford, 1998).

«The Tbilisi document goes beyond older conceptions of educational practice by linking environmental questions to political, economic, social and cultural elements within a given system rather than restricting them to their biological aspects...» (Layrargues, 2000).

The social nature of environmental problems – not just in terms of a social context, but in terms of being socially constructed – is articulated by Di Chiro:

«The environment is what surrounds us, materially and socially. We define it as such by use of our own individual and culturally imposed interpretive categories, and it exists as the environment at the moment we name it and imbue it with meaning. Therefore, the environment is not something that has a reality totally outside or separate from ourselves and our social milieux. Rather it should be understood as the conceptual interactions between our physical surroundings and the social, political and economic forces that organise us in the context of these surroundings. And if we view the environment as a social construct then we accept that certain qualities of it can be transformed according to whichever social relationships are in operation. If we view the environment as a social construct, we can also view the
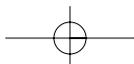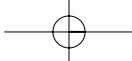
"environmental problem" very differently ... Environmental problems are ... social problems, caused by societal practices and structures, and only viewed or socially constructed as problems because of their effects on human individuals and groups (of course other living things and systems are also affected)» (Di Chiro, 1987).

The perspective that environmental issues – the subject matters of environmental education – are socially constructed has implications for individuals considering a change in profession from ecological science to environmental education. This is a shift from earlier perspectives that saw science as the most competent discipline for dealing with environmental problems. Littledyke suggested in 1997 that:

«Teachers who agreed most strongly with the claim that science is about facts, is a way of finding truths and is free of values ... tended to hold the view that science is the main means of solving environmental problems» (Littledyke, 1997).

Gayford suggests a possible reason for this:

«It is likely that because environmental education has had its roots in curriculum subjects like science and geography, the links have remained firm between environmental education and knowledge and understanding of the natural environment, particularly ecology...» (Gayford, 1998).

The UNAM students' perspectives suggest that once the possibility is countenanced that environmental issues are socially constructed, an epistemological adjustment is necessary. Not only is the discipline of science now seen as but one of several forms of disciplinary thinking required if environmental education is to adequately explore complex environmental issues, but the overall objectivist epistemology of science is now seen as being in need of replacement by a more socially constructivist epistemology – one that is more coherent with the socially constructed nature of environmental issues.

However, to bring an environmental dimension into higher education implies a significant structural change (Kentish, 2004; Barraza, 2002). This is not only a change in the schematic patterns of thought, but in active learning and participation. This is why there is an urgent need for reviewing the curricula, its contents and practices if environmental education is to become a commonplace (Robottom, 1983). To understand the diversity of relationships established between human beings and the environment it is of great importance to work with multiple research methodologies.

In environmental education research there are at least three reasons why we recommend a multi-methodological approach: 1) in education there is a need to address issues that are highly complex, and this entails a variety of methods; 2)
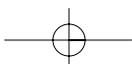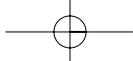
the use of alternative methods may contribute more valid and reliable results through triangulation; and 3) such an approach provides opportunities to 'test' a range of methods and to learn from this, for in any given research setting, deliberative choices among contending approaches will likely need to be made.

They are different ways of doing research that lead to a comprehensive explanation of the phenomena that are the objects of study. Deciding on a balance of quantitative and qualitative methods, for example, will entail a consideration of just what it is that we want to research (our research questions). For example, in general, quantitative research tends to study social issues independently from the subjects, while qualitative research looks for the significance of the social action, conceiving reality as a social construction (Robottom and Hart, 1993).

New approaches in education are moving towards a vision of a sustainable society, but what does this mean? Education for sustainable development embodies different theoretical and philosophical positions, particularly those of socially critical environmental education and green social theories (Barraza, et al., 2003). Critical education for sustainable development, within a postmodern context, enables a critique of modern Western science and its goals of progress. A critical education for sustainable development approach is of great relevance if awareness and actions about contextual conditions of the environment are to be given importance in the educational system.

We believe that in order to achieve a sustainable society, we need to develop a pedagogy for sustainable development based on constructive, transformative and participatory approaches – one capable of engaging what the UNAM students have referred to as social or political interests. This requires teaching and learning methods that promote a critical and a reflexive perspective in their learners (Barraza, et al., 2003; Tomkins, 1995) such as critical thinking techniques, cooperative learning, and community action, within a socially constructivist epistemology. It is this conceptual frame of social constructivism that is central to the idea of a 'professional turning point' in career changes from 'ecologist' to 'environmental educator'.

Conclusion

In this article we have argued that for those professionals contemplating a career move from that of professional ecologist to that of environmental educator, there is likely to be a 'turning point' – an epistemological adjustment – that will need to be negotiated. Such professionals may well need to reconcile their former (ecological) 'aspiration to be objective' with a new 'aspiration to respect the subjective'. And this turning point will likely have implications for
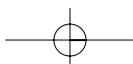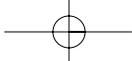
both the way curriculum content knowledge and curriculum development and dissemination is constructed.

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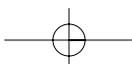
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