

Education for Sustainability for the K-6 Curriculum: A Unit of Work for Pre-Service Primary Teachers in NSW

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Abstract Although the need for education for sustainability in pre-service teacher education is well recognised, little has been published to indicate how this might be incorporated into university courses in Australia. This paper describes one attempt to encourage pre-service primary teachers to include education for sustainability in their future work. It includes a discussion about some of the choices made regarding teaching methods and content. The overall purpose of the article is to encourage others to contribute their ideas to the discussion over how best to incorporate education for sustainability in pre-service teacher education in Australia.

Introduction

If teachers are to engage their students effectively in education for sustainability, it is a reasonable assumption that they should have an understanding of education for sustainability as a concept and a secure knowledge of key contemporary environmental issues. However, Tilbury, Coleman and Garlick (2005) contend that sustainability education is poorly represented in Australian teacher training courses at the present time. This may partly explain why Cutter-Mackenzie and Smith (2003) found that many primary school teachers in Australia appear to be functioning at a knowledge level of what they call “ecological illiteracy”. In response to these and other criticisms in the literature a decision was taken at the University of New England (UNE) to develop a compulsory semester long teaching unit titled “Education for Sustainability in the K-6 Curriculum” for the primary Bachelor of Education degree. The unit is taken by 4th (final) year pre-service primary teachers. It was taught for the first time in semester 1 of 2007 and will be the subject of on going evaluative research.

In the following description of the unit development the authors have drawn upon a framework proposed by Gutek (1997). This framework describes a philosophy of education comprising five aspects, each of which influences teaching and learning. For the practitioner these aspects are: espoused educational aims of the relevant institution; the epistemology used to identify what counts as knowledge; curriculum content; the learning theory through which learners learn; and accepted teaching practices. Gutek’s framework is useful in so far as it recognises teaching as a practical pursuit that occurs

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within a context shaped by external demands as well as by the internal beliefs of the teacher (Hart, 2003). This article discusses the development of the new education for sustainability unit at UNE with reference to each aspect of Gutek's framework, and includes discussion of some specific elements of the unit.

Educational Aims of the Institution

The educational aims of several institutions were relevant to the development of the unit. Institutional aims have significance because they frame the definition of education for sustainability that teachers in Australian schools are urged to adopt. Of particular relevance were the educational aims of the university, of the Commonwealth Government of Australia through its *National Environmental Education Statement for Australian Schools* (Australian Department of Environment and Heritage, 2005), of the New South Wales (NSW) Government through the *NSW Policy on Environmental Education for Schools* (NSW Department of Education, 2001), and of the NSW Institute of Teachers through its Framework for the National Recognition of Approved Pre-Service Teacher Education.

The *National Environmental Education Statement for Australian Schools* uses the terms "environmental education for sustainability" or "education for sustainability" and has broad aims derived in part from the global environmental initiatives of UNESCO (UNESCO, 2004), and from the work of particular researchers, for example, Tilbury (2005) and Fien (2001). According to the *National Environmental Education Statement for Australian Schools* (Australian Department of Environment and Heritage, 2005, p. 8)

environmental education for sustainability involves approaches to teaching and learning that integrate goals of conservation, social justice, cultural diversity, appropriate development and democracy into a vision and a mission of personal and social change. This involves developing the kinds of civic values and skills that empower all citizens to be leaders in the transition to a more sustainable future.

This conceptualisation of education for sustainability suggests inclusion of a broad range of skills, values, knowledge and understandings. The emphasis is not on the transmission of particular knowledge but rather reflects an ideology of a democratic and collective process of change.

Pre-service teacher courses in NSW are also influenced by the NSW Institute of Teachers who require the university to comply with a Framework for the National Recognition of Approved Pre-Service Teacher Education. The approval framework stipulates subject matter and pedagogy for the various Key Learning Areas but not education for sustainability. This situation impacts significantly on the provision of education for sustainability as its inclusion rests upon its integration into subject and/or pedagogy based units of study at the discretion of the providers.

Different institutions use different terms for education for sustainability and provide different definitions and points of emphasis. However as Chapman (2007, p. 129) argues, "the point is that people with fundamentally different views can use the same environmental goal statements and language and mean completely different things". Whatever terminology is used "probably the most important thing is what we do rather than what we call it" (Chapman, 2007, p. 129). The implication for pre-service teacher education is that students should have the opportunity to debate their own interpretation of education for sustainability in the light of their own experiences, but taking into consideration institutional aims. Part of this process involves thinking through what it is that they aspire to do. Given Chapman's argument, and whilst

we recognise the debate about the terminology and nuances of meaning (McKeown & Hopkins, 2003; Chapman, 2007; Robottom, 2007; Jickling, 2006), we will use the common terms “environmental education” and “education for sustainability” in the following discussion.

Epistemological Stance

Education for sustainability is generally espoused as including economic and social as well as ecological sustainability. Whilst scientifically derived knowledge is an essential tool in the resolution of environmental problems and decision making for the future, it is not in itself sufficient for education for sustainability. Robottom (2007, p. 28) argues that environmental issues are value laden and contextual by nature and therefore science education is “a limited vehicle for promoting and implementing environmental education”. Indeed, he goes on to suggest that environmental education “might provide a useful conceptual framework for teaching science ... in an integrated way” (Robottom, 2007, p. 28). However, Robottom acknowledged the usefulness of both specific scientific learning and a broader, deeply contextual learning, both rooted in learning through experience of the real world. It follows that learning for pre-service teachers should be organised to be deeply contextual (UNESCO, 2005), where relevant “contexts” include the schools in which novice teachers are likely to seek employment, their local communities, and employer curriculum requirements.

Curriculum Content

A curriculum consists of the organised experiences of students under the guidance of their tutors. Tutors must make a value judgement about which experiences and subject matter are most useful for pre-service teachers. Such decisions are contingent upon the values and experience of the tutors, and also the opportunities and constraints that exist in contemporary schooling. To ignore these constraints during the pre-service period may result in novice teachers being unable to overcome many of the challenges they may face in attempting to provide effective education for sustainability for their students. The example from the literature that follows influenced the authors in their content choice for the unit.

Comber, Nixon and Reid (2007, p. 151) have reported on their work with teachers from the Murray Darling Basin of Australia, an area suffering from prolonged drought and salinity problems. They recognised the challenges facing teachers who wanted to explore these environmental issues with their students:

Developing in-depth knowledge of complex ecological issues is a significant undertaking, and the challenge of improving and increasing teacher knowledge about environmental sustainability has not been easy. To begin with it has occurred at the same time in history as teachers’ attention has been directed (by employers and systems) towards a greater political concern – the literacy outcomes of students on national standardised tests of reading and writing. Secondly, because of the political and monetary investments of individuals and agencies in the environment and our “natural resources”, this is a contested field, where available information is often problematic and partisan.

The implication of this statement is that providing opportunities for pre-service teachers to develop content knowledge and the skills to teach problematic content knowledge should be a part of any unit offered in environmental education. Furthermore, the statement highlights the current emphasis on the “basics” of literacy, mathematics and science. Although many teachers are able to use the environment as a highly significant conduit for teaching these “basics”, the emphasis on standardised testing

is commonly seen as a constraint on teacher autonomy (Stevenson, 2007). This was an excellent example of how perceived priorities in education constitute an influential part of the teacher's context and may in fact constrain the teaching of education for sustainability. Here was a case for providing pre-service teachers opportunity to construct integrated teaching programs focussed on the environment.

Cutter-Mackenzie and Edwards (2006) also argue that it is important for teachers to be able to draw on their content knowledge to inform teaching and learning. However, as mentioned previously, content knowledge amongst pre-service teachers may often be limited. A recent study by Taylor et al. (2006) involving over 100 pre-service primary teachers confirmed this. Only about one quarter of the students could select the correct definition for biodiversity, about one half knew that most electricity in NSW was generated from coal and very few recognised that vegetation clearing was the greatest threat to Australian farmland.

While the arguments for producing a unit with some emphasis on developing content knowledge are clear, education for sustainability should also be about changing attitudes and behaviour. As Hungerford and Volk (1990) argued, changes in environmental knowledge do not change environmental attitudes or behaviour, a point also acknowledged by Meyers (2006) who recognises that knowledge gains are a necessary but not sufficient aspect of learning.

Moreover whilst factual knowledge in education for sustainability has importance, teachers entering the profession now, with a potential career extending over 30 to 40 years, will inevitably have to cope with ever changing information about the environment. Consequently, in developing the unit our concern was more with the processes of learning than with the acquisition of factual information. Thus, a wide range of learning strategies such as co-operative learning, critical thinking, first hand investigations in the field, multi-modal student presentations, learning through reflection on outdoor games and interactive web activities were used to develop the students' understanding of issues such as nuclear power, salinity, biodiversity, consumption, waste, etcetera. In this way, the content of the unit was as much about pedagogy as it was about the environment and assisted students to find and share useful resources that would support their teaching in later years.

The institutional aims that contributed to the shaping of the teacher education unit are largely about civic values and skills, vision and change rather than specific subject understanding. Thus, students also engaged in values analysis and took the opportunity to critique various tools that could be used to carry out values analysis in a classroom. Furthermore, students evaluated various technologies for their contribution to sustainability, considered ways of evaluating alternatives in technology in the primary school and how such activities were relevant to sustainability.

Learning Theory

Whilst Dillon (2003) suggests that learning theory is not widely discussed in environmental education literature, Meyers (2006, p. 466) maintains that there "is agreement on the usefulness of constructivist learning theory" in environmental education. Meyers (2006, p. 466) interprets constructivist theory as the provision of semi-structured learning experiences where:

learners experience the natural environment, gain direct experience with natural processes – their fragility, human need for them, human impact on them - and gain the skills needed to investigate how to take effective actions on their environmental concerns ... There appears to be near unanimity of opinion in environmental education research that providing students with significant

opportunities to conduct a guided inquiry into the socio-political aspects of an environmental question ... is a key teaching methodology for facilitating environmental learning.

There appear to be few empirical studies investigating the use of guided inquiry into environmental questions of the kind Meyers suggests, and this is not surprising given that there is very little at all in the research literature that reports on the processes of learning in environmental education programs (Rickinson, 2006, p. 446). Nonetheless, for the pre-service teacher unit discussed here, it was possible for a process of “guided inquiry” to be included, as described below, with a traditional transmission approach used on few occasions.

The institutional aims described above, where education for sustainability is seen as “a vision and a mission of personal and social change” and involves empowering “all citizens to be leaders in the transition to a more sustainable future” (Australian Department of Environment and Heritage, 2005, p. 8) are socially critical in so far as they imply a criticism of contemporary societal values as well as implying a need for change. Where such goals are considered to be valid, there is an implication that teacher education would incorporate opportunities for a critical analysis not only of societal values in general but also of personal values and actions in terms of the long term sustainability of the planet.

Accepted Teaching Practices

The teaching practices adopted for the unit related to the epistemological stance held by the tutors. This was influenced by a number of factors including the view of learning theory described by Meyers (2006); the tutors’ experiences of environmental education including contemporary teaching practices in schools; consideration of the needs of pre-service teachers in their future work, and the implied practices embodied in the stated aims for environmental education as in the examples above. Moreover, consideration needed to be given to the claim that the pedagogy that teachers experience as student learners is influential on their choice of strategies as teachers (see Miles, Harrison & Cutter-Mackenzie, 2006 for a discussion). If student teachers are to adopt teaching strategies intended to move their students towards more sustainable practices, it would seem appropriate to expose them to a broad range of potential strategies, and to allow them to reflect upon these. A selection of the teaching strategies employed during the unit is described below.

Experiential Learning Beyond the School Gate

Considerable time was expended in natural places where students engaged in aesthetic appreciation designed to develop a conception of “what it is we are trying to sustain [ecologically]” (Stewart, 2006, p. 89). Outdoor experiences were combined with opportunities to engage with relevant school based learning strategies in field conditions and to evaluate these. Time was also taken to explore parts of the local community (such as the sewerage treatment works) and to demonstrate how pragmatic relationships could be built between schools, local council and other groups.

Inquiry Learning

Kyburz-Graber and Robottom (1999) have argued that there is a need for pre-service teachers to experience and reflect upon interdisciplinary projects in the local environment. This view also receives support in the *National Environmental Education Statement for Australian Schools* (Australian Department of Environment and Heritage, 2005) and within the NSW Quality Teaching framework (Ladwig & King, 2003), which is

currently being promoted state-wide in schools. Given the tutors' agreement with such an approach, teaching and learning experiences were planned through inquiry based interdisciplinary projects. Inquiry learning involves an investigation into the physical and socio-political dimensions of an environmental issue with a view to influencing environmental practice for the better (Meyers, 2006).

The inquiry learning process summarised in Figure 1 was used as a framework for student assessment. Students chose an environmental issue of concern to them, and were encouraged to actively and independently investigate their chosen issue in the context of the local environment. They were also required to explain how the issue was a manifestation of a broader issue of national and global significance. Amongst other things, social actions that students performed included voluntary tree planting with local Landcare groups, campaigns in their residential colleges to reduce water or energy use, and undertaking relevant teaching segments with children in local schools.

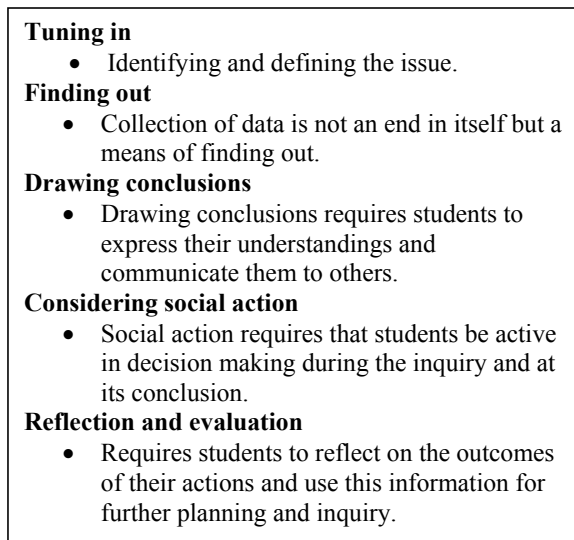


FIGURE 1: A model of inquiry learning (Department of Environment and Heritage, 2005, p. 21)

Planning for Environmental Education

Within the unit, students also had opportunities to examine examples of whole school approaches to environmental education (Henderson & Tilbury, 2004) and the associated collaborative social change emphasis of many of the exponents of education for sustainability (Fien, 1993; Huckle, 2005). Opportunities were also provided for students to plan learning sequences in environmental education that could be integrated into a number of Key Learning Areas across the primary curriculum. It was hoped that these experiences would help them overcome some of the problems associated with incorporating environmental education in an already crowded curriculum. Students also critiqued Jensen's (2002) model of learning for action competence (Figure 2). This model, with its inclusion of the analysis of values underpinning everyday choices and of action for change is in many ways an expression of a socially critical orientation of education for sustainability. Its potential as a planning tool was also considered by the students.

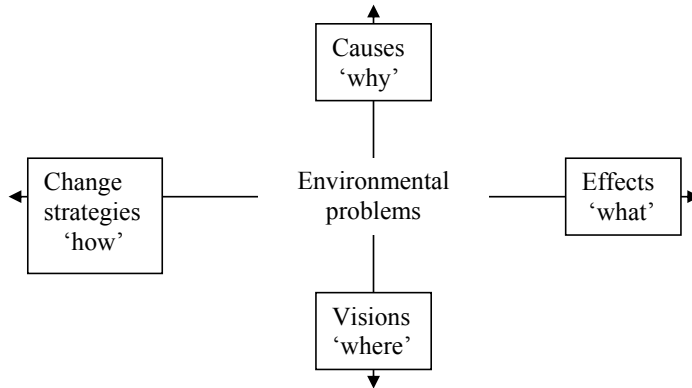


FIGURE 2: Jensen's (2002) model showing the four areas that teachers need to address for "action competence"

Values Analysis

The clarification and analysis of values has already been mentioned and is consistent with the aims of the institutions as described at the beginning of this article. Kyburz-Graber and Robottom (1999, p. 286) argue that the first concern of many teachers was the "appropriateness of environmental education in schools" and "what kind of environmental education is achievable within particular schools". In addition various proponents for the inclusion of environmental education in school curricula provide different views on what that might be. For example, McLeod (2007, p. 38) a primary school teacher in London, held the following world view:

"Developed" western nations, however, remain ideologically distanced from sustainability, promoting burgeoning consumption and limitless economic growth as the primacy for "development"; their educational institutions accordingly feeding young people into this flawed system; completely inhospitable to the principles of learning for sustainability.

For McLeod (2007), education for sustainability should be interpreted "in its strongest form", and should be a "serious effort to achieve social change". However, Fien (2003, p. 2) has suggested a change in emphasis in environmental education:

It is true, we have focussed on structural change to the neglect of personal change in environmental education, and we have neglected the important links between personal, social and ecological well-being. It is also very true that we have ignored spiritual ways of knowing and empowerment .

The point being made here is that there is an absence of consensus on what environmental education should actually look like in schools, there is teacher uncertainty as to what is achievable in particular school contexts and even uncertainty as to whether or not environmental education is appropriate in schools. It may therefore be that a significant role for a unit in environmental education for pre-service teachers is the provision of opportunities for students to gain a picture of what contemporary environmental education looks like in schools, to have opportunity to compare views such as those presented above, to analyse the values inherent in each, and to formulate their own goals for the future.

Conclusion

Many researchers and many institutions have advocated the inclusion of environmental education in teacher preparation courses (see Miles, Harrison & Cutter-Mackenzie, 2006 for a summary). However, as stated previously, Tilbury, Coleman and Garlick (2005) contend that sustainability education is poorly represented in teacher education courses in Australia at the present time. Whilst there are published programs and suggestions available (for example United Nations Educational Scientific and Cultural Organisation, 2002; Boylan & Collin, 2006) and we have drawn upon these, we believe that there needs to be a more deeply school based contextualised discussion of the specific pedagogies that will encourage and enable pre-service teachers to adopt an education for sustainability approach. Our work is very much grounded in the realities that our teachers will experience in NSW schools as we believe that this is the most likely way in which our students will develop the motivation and confidence to incorporate education for sustainability in their teaching careers.

Keywords: pre-service teachers; education for sustainability; teacher education.

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