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6. ENVIRONMENTAL SUSTAINABILITY IN SCHOOLS

Tensions around Teaching a Global Imperative

ABSTRACT

Despite efforts over the past 40 plus years, environmental sustainability is still on the margins of the curriculum in most countries. While there is much evidence that children enjoy learning *about* and *in* the environment, many teachers remain reluctant to teach environmental sustainability, and governments frequently marginalise the area. This chapter discusses the need for education for sustainability as part of global citizenship and provides a history of the implementation of environmental sustainability education in schools, with a particular emphasis on Australian and English schools, and the tensions that have been encountered. It also gives some examples of instances where environmental sustainability has been successfully implemented in schools, and concludes with a discussion of some of the challenges for the future. A thread throughout these discussions is the relationship between environmental and science education because these fields have long been seen as related in a schooling context.

Keywords: environmental education, sustainability, science education, global citizenship

INTRODUCTION

Since the late 1960s, there has been a global imperative to educate people to protect and enhance their environment. For example, at a conference held at the University of Keele in 1965, it was agreed that environmental education “should become an essential part of the education of all citizens, not only because of the importance of their understanding something of their environment but because of its immense educational potential in assisting the emergence of a scientifically literate nation” (Wheeler, 1975, p. 8), and the United States Congress passed an Environmental Education Act in 1970 (McCrea, 2006, p. 4). The 1972 *United Nations Declaration on the Human Environment* reinforced the importance of environmental education in having as one of its principles that:

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Education in environmental matters, for the younger generation as well as adults, giving due consideration to the underprivileged, is essential in order to broaden the basis for an enlightened opinion and responsible conduct by individuals, enterprises and communities in protecting and improving the environment in its full human dimension. (United Nations, 1972, p. 3)

More recently, the post-Millennium Development Goals agenda stated that, “Environmental sustainability is a core pillar of the post-2015 agenda and a prerequisite for lasting socioeconomic development and poverty eradication” (United Nations, 2013a, p. 2). Hence, environmental sustainability education continues to be needed as part of the core of global learning for the twenty first century, and this is reflected in the *Roadmap for Implementing the Global Action Programme on Education for Sustainable Development* (UNESCO, 2014), although not in the national curricula in either Australia or England, or many other countries.

As I discuss in this chapter, despite efforts over the past 40 plus years, environmental sustainability is still on the margins of the curriculum in most countries. While there is much evidence that children enjoy learning about and in the environment, with some programs also promoting a “for the environment” component (Ballantyne, Fien, & Packer, 2001; Gough & Sharpley, 2005), many teachers remain reluctant to teach environmental sustainability (Blumstein & Saylan, 2007; Spork, 1992; Thomas, 2005), and governments frequently marginalise the area (Gough, 1997; Hickman, 2013; United Kingdom National Commission for UNESCO, 2013; Victorian Department of Education and Training, 2014). In addition, although long recognised as a goal for school education in many countries (for Australian and English examples see, Australian Education Council, 1994; Chatzifotiou, 2006; Ministerial Council on Education Employment Training and Youth Affairs, 1999, 2008; United Kingdom National Commission for UNESCO, 2013), the inclusion of sustainability in curriculum documents continues to meet resistance (Donnelly & Wiltshire, 2014; Hickman, 2013), at the same time as the planet faces increasing environmental crises which would seem to make the need for the teaching of environmental sustainability even more urgent.

In this chapter, I first discuss the need for education for sustainability in a global context, and then describe a history of the implementation of environmental sustainability education in schools, with a particular emphasis on Australian and English schools, and the tensions that have been encountered. In the third section, I provide some examples of instances where environmental sustainability has been successfully implemented in schools, and then conclude with a discussion of the challenges for the future. A thread throughout these discussions is the relationship between environmental and science education because these fields have long been seen as related in a schooling context.

THE GLOBAL NEED FOR EDUCATION FOR SUSTAINABILITY

The field that has become environmental education emerged from the growing awareness of the (usually human-created) threats to the environment during the 1960s. At that time, the environment was seen primarily as a set of natural ecosystems with the environmental crisis being understood as a consequence of the increasing contamination of land, air and water; the growth in human population; and the continuing depletion of natural resources. The urgency to address this crisis was recognised in the Stockholm Declaration from the 1972 United Nations Conference on the Human Environment, which focused on the need to “inspire and guide the peoples of the world in the preservation and enhancement of the human environment”, where “both aspects of man’s environment, the natural and the man-made, are essential to his well-being and to the enjoyment of basic human rights the right to life itself” (United Nations, 1972, p. 1). This may be interpreted as a humanist agenda because, according to Stables and Scott (1999), “‘Humanism’ is generally held to refer to sets of beliefs which are anthropocentric: in other words, which are concerned with the perspective and welfare of humanity, though this does not preclude care for the natural environment” (p. 146). However, the intention of the agenda at this time was more holistic, going beyond “care of the natural environment” to a concern with acting for the environment to achieve a better quality environment for all living things.

The origins of the international environmental education/education for sustainable development (ESD) movement are in the 1972 United Nations Conference on the Human Environment, and as United Nations and UNESCO documents provide the globally shared visions of environmental education that inform national actions over the decades, these documents provide the source documents for this discussion.

The concerns about the natural environment as well as the human environment, expressed in Principle 1 of the Declaration from that conference, are reflected in the Belgrade Charter (UNESCO, 1975) which stated that:

... the foundations must be laid for a world-wide environmental education programme that will make it possible to develop new knowledge and skills, values and attitudes, in a drive towards a better quality of environment and, indeed, towards a higher quality of life for present and future generations living within that environment. (p. 2)

Over the following decades there was a transition in terminology with “environmental education” increasingly being replaced by “education for sustainable development” (United Nations, 1993, 2002). In particular, the vision broadened from focusing on “the role of education in pursuing the kind of development that would respect and nurture the natural environment” to encompass “social justice and the fight against poverty as key principles of development that is sustainable” (UNESCO, 2004, p. 7). This change is significant in that the environment is now

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seen as a “natural resource base for economic and social development” in the World Summit report (United Nations, 2002, p. 2), and notions of improving the quality of the environment, contained in earlier statements, have disappeared and been replaced by a focus on the welfare of humanity – a major shift towards a humanist agenda.

Similarly, somewhere between the environmental education statements from the 1970s and those that have appeared in the last decade (UNESCO, 2004, 2005, 2013, 2014), a concern for the environment disappeared and the focus became the human condition. For example, the “definition” of ESD contained in the *Roadmap for Implementing the Global Action Programme on Education for Sustainable Development* (UNESCO, 2014) was: “ESD empowers learners to take informed decisions and responsible actions for environmental integrity, economic viability and a just society, for present and future generations, while respecting cultural diversity” (p. 12). This statement was consistent with the commitment to ensuring “the promotion of an economically, socially and environmentally sustainable future for our planet and for present and future generations” in *The Future We Want* (United Nations, 2012, p. 1). It was also consistent with the post-Millennium Development Goals agenda (United Nations, 2013a, 2013b) which placed “Put sustainable development at the core” as the second of five big transformation shifts² that the UN Secretary-General’s High Level Panel believed needed to be made in their universal agenda: “Our vision and our responsibility are to end extreme poverty in all its forms in the context of sustainable development and to have in place the building blocks of sustained prosperity for all” (United Nations, 2013b, p. iii). Sustained prosperity includes achieving universal primary education and an extension to universal secondary education.

Continuing what was started with the UNESCO international implementation scheme for the *Decade of Education for Sustainable Development 2005–2014* (UNESCO, 2004) – which brought together the Millennium Development Goals (MDG) process, the Education for All (EFA) movement, and the United Nations Literacy Decade (UNLD) with ESD – education for sustainability is increasingly being interwoven with other international education priorities. An important example here is the UN Secretary-General Ban Ki-moon’s Global Education First Initiative (GEFI) which had as its goal: “to empower learners to engage and assume active roles both locally and globally to face and resolve global challenges and ultimately to become proactive contributors to a more just, peaceful, tolerant, inclusive, secure and sustainable world” (Vivekanandan, 2014, para. 2).

What follows from this convergence in international discourses related to sustainability and global citizenship is the need for education in schools to reflect these movements.

ENVIRONMENTAL EDUCATION FOR SCHOOLS

The history of environmental education in schools is one of marginalisation within the curriculum and an on-going association with science education, even though

science education has long been characterized as a limited vehicle for environmental education (Gough, 2002; Lucas, 1980). In this and the following sections, I trace some of the history of environmental education in the Australian and English national curriculum statements, and the tensions and resistances encountered by environmental education in both places and elsewhere.

Australia and England both commenced the development of their national curriculum in the late 1980s (Chatzifotiou, 2006; Education Council, 2014), however, while the English national curriculum was introduced in 1990, Australia only implemented its national curriculum in all states and territories from 2014. In both curricula, environmental education (later called sustainability) was originally included as a cross-curriculum theme, but this status is now being diminished in both countries (Donnelly & Wiltshire, 2014; Hickman, 2013).

Framing Statements

Early statements on environmental education in Australia, such as the Curriculum Development Centre's *Environmental Education for Schools* (Greenall, 1980), drew on the 1972 Stockholm Declaration on the Human Environment, together with the 1975 Belgrade Charter and the 1977 Tbilisi Declaration (even though the latter two documents were not explicitly mentioned). The stated aims were concerned with the total environment – for example, “to help students develop a basic understanding of the total environment and the interrelationships of man and the environment” and “to help students develop the skills necessary for investigating the total environment and for identifying and solving environmental problems” (Greenall, 1980, p. 4). This total environment as “the self-contained system that supports all the life on Earth” (p. 6) has many components, broadly classified as natural, built, technological, and social (which includes the economic, political, technological, cultural-historical, moral and aesthetic aspects). Environmental education was seen as “developing a concern for the environment, developing a willingness to take responsible action to improve the quality of life, and accepting responsibility for environmental management”, and involving “all students and all subjects at all levels” (p. 5).

Similar statements were made in regard to environmental education in the English national curriculum, which was also grounded in the Tbilisi Declaration, and adopted a holistic approach to environmental issues and encouraged “providing opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment” (Chatzifotiou, 2006, p. 369) across the curriculum.

Over subsequent decades and declarations on common and agreed national goals for schooling in Australia, the references to environmental education became weaker and more closely aligned with a neoliberal agenda. For example, in 1989 the Australian Education Council (AEC) proposed ten common and agreed national goals for schooling in Australia, entitled the Hobart Declaration, which included the need to develop in students “an understanding of and concern for balanced

development and global environment” (AEC, 1994, p. 43). This rather weak goal was already taking on the political, cultural, and economic logic of neoliberalism (Hursh, Henderson, & Greenwood, 2015) consistent with a focus on treating the environment as a commodity (Shiva, 1991) in its reference to “balanced development”. However, that the goal existed was sufficient to stimulate a range of environmental education activities by departments of education around Australia (see Gough 1997, 2002) that are beyond the scope of this chapter.

Another decade on, the April 1999 Adelaide Declaration (*National Goals for Schooling in the Twenty-first Century*) included a goal that “when students leave school they should ... have an understanding of, and concern for, stewardship of the natural environment, and the knowledge and skills to contribute to ecologically sustainable development” (MCEETYA, 1999, p. 1). The Adelaide Declaration goal had a companion and cross-referencing document, Environment Australia’s (2000) national action plan *Environmental Education for a Sustainable Future*, which (re)defined environmental education “in its broadest sense to encompass raising awareness, acquiring new perspectives, values, knowledge and skills, and formal and informal processes leading to changed behaviour in support of an ecologically sustainable environment” (p. 3). Importantly, a key element in the plan was seen as “providing people with the knowledge, values and skills to actually make a difference to the protection and conservation of Australia’s environment” (p. 5). Addressing environmental challenges was understood in a holistic way because “the challenges themselves frequently have social, scientific, cultural, economic and ethical aspects, all of which must be considered for their effective management” (p. 4). The vision for environmental education in this national action plan, as well as the Adelaide goal, were consistent with earlier international environmental education discourses, with their references to “stewardship of the natural environment” (Environment Australia, 2000, p. 6) and “actions which result in better environmental outcomes” (p. 4).

The *Melbourne Declaration on Educational Goals for Young Australians* was released in 2008, and it included as Goal 2, “All young Australians become successful learners, confident and creative individuals, and active and informed citizens ... [and] work for the common good, in particular sustaining and improving natural and social environments” (MCEETYA, 2008, pp. 8–9). However, the only action related to the environment included in the Declaration document was “a focus on environmental sustainability will be integrated across the curriculum” (MCEETYA, 2008, p. 14), which was part of the recommendations for framing what became the Australian Curriculum (ACARA, 2014a), with a cross curriculum priority of Sustainability (ACARA, 2014b). Interestingly, the Preamble to the Melbourne Declaration intimates that science understanding is important in meeting complex challenges such as climate change but, as discussed below, the Science curriculum does little to educate young Australians to meet these challenges.

A relationship between environmental and science education was also strong in the English national curriculum from 1995, when the cross-curriculum themes were abandoned and environmental education was incorporated within the core subjects

of science and geography (Chatzifotiou, 2006). This association of environmental or sustainability education with science and geography was reinforced in a Department of Education (2013) press release which spelt out how the new National Curriculum would provide pupils with better understanding of all climate issues, including climate change – but the new curriculum no longer refers to sustainable development, and it “has removed any notion of environmental stewardship at just the age when children are most curious about – and in awe of – the natural world they see around them” (Hickman, 2013).

According to the UK National Commission for UNESCO (2013), the “reduced government focus on sustainable development has resulted in increased uncertainties amongst educational institutions and practitioners about how much emphasis to place on sustainability within teaching and learning” (p. 17). There is also a recent reduction of focus on sustainability in the Australian curriculum, which is reflected in Recommendation 17 of the Donnelly and Wiltshire review report (2014): “ACARA reconceptualise the cross-curriculum priorities and instead embed teaching and learning about ... sustainability explicitly, and only where educationally relevant, in the mandatory content of the curriculum” (p. 247). In the light of this greater marginalisation of sustainability, as an example of how sustainability is treated in a national curriculum, the following section focuses on the Australian Curriculum.

The Australian Curriculum about Sustainability

Although the Australian Curriculum statement about Sustainability is consistent with the holistic approaches to environmental education and sustainability outlined earlier, the actual content of the four core areas of the Australian Curriculum (English, History, Mathematics, and Science) does not enact the statement’s intent, nor is there guidance for teachers in implementing the Organising Ideas for Sustainability (ACARA, 2014b) – see [Table 1](#).

These organising ideas are particularly interesting for their valuing of the environment for its own sake, rather than just as a resource for exploitation, which, as discussed earlier, is where the international statements are now focused. However, there is a mismatch between the Sustainability cross curriculum priority statement and these organising ideas.

There is a specific symbol (✚) to indicate particular content where the Sustainability cross curriculum priority is appropriate in each of these four core curriculum statements. However, this symbol rarely occurs across the eleven years of schooling covered by the curriculum statements (not at all in English and Mathematics; five times in History where it is only associated with teaching about “The environment movement (1960s to present)”, which is one of three electives in one of three depth studies in Year 10; and eight times in the Science curriculum across six year levels). The year level descriptions in English from Year 5 onwards refer to students studying texts that explore themes of interpersonal relationships

Table 1. Sustainability organising ideas in the Australian curriculum (ACARA, 2014b)

<i>Systems</i>	
OI.1	The biosphere is a dynamic system providing conditions that sustain life on Earth.
OI.2	All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.
OI.3	Sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems.
<i>World views</i>	
OI.4	World views that recognise the dependence of living things on healthy ecosystems, and value diversity and social justice are essential for achieving sustainability.
OI.5	World views are formed by experiences at personal, local, national and global levels, and are linked to individual and community actions for sustainability.
<i>Futures</i>	
OI.6	The sustainability of ecological, social and economic systems is achieved through informed individual and community action that values local and global equity and fairness across generations into the future.
OI.7	Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.
OI.8	Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts.
OI.9	Sustainable futures result from actions designed to preserve and/or restore the quality and uniqueness of environments.

and ethical (and global in Years 9 and 10) dilemmas in real-world and fantasy/fictional settings, but there is no specific guidance to teachers for implementing the Sustainability organising ideas.

None of the content descriptions associated with the 🌱 symbol relate the content to the Sustainability overview statement that, “Education for sustainability develops the knowledge, skills, values and world views necessary for people to act in ways that contribute to more sustainable patterns of living” (ACARA, 2014b, para. 6).

The five content descriptions in History can be interpreted as addressing several of the Sustainability Organising Ideas (see Table 1) but, because “The environment movement (1960s to present)” is an alternative elective to “Popular Culture (1945–present)” and “Migrant experiences (1945–present)” (ACARA, 2014c), the numbers of teachers choosing to study the environment movement could be low.

The eight times that the 🌱 symbol appears in the Science Curriculum are as follows (ACARA, 2014d):

- people use science in their daily lives, including when caring for their environment and living things (Year 2, Science as Human Endeavour strand, Use and influence of science, para. 1);
- Earth's surface changes over time as a result of natural processes and human activity (Year 4, Science Understanding strand, Earth and space sciences, para. 1);
- interactions between organisms can be described in terms of food chains and food webs; human activity can affect these interactions (Year 7, Science Understanding Strand, Biological sciences, para. 2);
- multi-cellular organisms contain systems of organs that carry out specialized functions that enable them to survive and reproduce (Year 8, Science Understanding Strand, Biological sciences, para. 2);
- People use science understanding and skills in their occupations and these have influenced the development of practices in areas of human activity (Year 8, Science as a Human Endeavour Strand, Use and influence of science, para. 2);
- ecosystems consist of communities of interdependent organisms and abiotic components of the environment; matter and energy flow through these systems (Year 9, Science Understanding Strand, Biological sciences, para.2);
- chemical reactions, including combustion and the reactions of acids, are important in both non-living and living systems and involve energy transfer (Year 9, Science Understanding Strand, Chemical sciences, para.3); and,
- global systems, including the carbon cycle, rely on interactions involving the biosphere, lithosphere, hydrosphere and atmosphere (Year 10, Science Understanding Strand, Earth and space sciences, para.2).

That environmental education has been reduced to these eight areas of content in the national Science curriculum is a travesty compared with the initial framing statements for the field, given that, to meet the challenges of complex environmental, social and economic pressures, "Australians must be able to engage with scientific concepts and principles and approach problem solving in new and creative ways" (MCEETYA, 2008, p. 5). Although cross-curriculum in name, there are no strategies for supporting teachers to collaborate and involve "all students and all subjects at all levels" (Greenall, 1980, p. 5) – the emphasis in this curriculum is very much on subject silos.

Unfortunately, a comparison of the Sustainability organising ideas (which give more prominence to "environment" than most other recent statements in Australia) with the most recent UNESCO statements about education for sustainability is a futile exercise because, as discussed above, the content of the four core Australian Curriculum statements (English, History, Mathematics, and Science) does not match the ideals of the organising ideas, which makes the organising ideas unlikely to be implemented, and it has recently been announced by the Education Council (ACARA, 2015a) that the curriculum's presentation is being simplified and that "references to indigenous culture, environmental sustainability and Asia – which are included

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throughout the existing curriculum, including in maths – had been cut back to “where they naturally fit”, with an emphasis on history, geography and art” (Randall, 2015, as cited in Bitá, 2015, p. 10). That there is an important relationship between environmental sustainability and science education seems to be totally overlooked in this simplified curriculum, which is not surprising given the minimal relationship between science and sustainability in the current version of the Australian Curriculum discussed above. Thus, although the organising ideas promised the possibility of environmental sustainability becoming part of the Australian Curriculum, one can only be disappointed, not surprised. The simplification of the Australian Curriculum to a focus on “phonics, coding and faith as nation’s schools go back to basics” (Bitá, 2015, p. 1) is an example of what Foucault (1978) calls bio-power, which is not just governmental power, but a power that is invisible, plural, discursive, pervasive and enforced, via a plethora of power relationships, to manage human life, bodies, and species for economic and political ends.

TENSIONS WITH TEACHING ENVIRONMENTAL SUSTAINABILITY

Since its early formulations, environmental education it has struggled to find a place in the school curriculum. Some of these tensions have been in its relationship with science education, and, as noted earlier, from proponents of environmental education seeing it as multidisciplinary and holistic. It is this latter approach that was adopted in the Australian Curriculum (ACARA, 2014b), and I have already discussed the tensions inherent in incorporating sustainability into this new curriculum. I will now focus on the tensions with science education before moving on to some examples of the successful implementation of environmental sustainability in schools.

Environmental Sustainability and Science Education

As noted earlier, the field that has become environmental education arose out of the growing awareness of the threat of environmental degradation in the 1960s. Increasingly throughout that decade, scientists such as Rachel Carson (1962) drew attention to the growing scientific and ecological problems of the environment and the need for greater public awareness of these problems, such as the increasing contamination of land, air and water; the growth in world population; and the continuing depletion of natural resources. The scientists’ calls were for more information about the environment for the public, and for education.

In the wake of publicity and political actions attending these concerns, environmental education initially entered school curricula in the early 1970s through science education (Gough, 1997). Indeed, at that time there was a broad acceptance in society that threats to human well-being and the environment could be countered through further scientific research and the application of technology. Such a belief is exemplified in the Tbilisi Declaration (UNESCO, 1978) where it states “Education

utilising the findings of science and technology should play a leading role in creating awareness and a better understanding of environmental problems” (p. 24).

In its early formulations, the explicit aims of environmental education were often concerned with stimulating a sense of individual responsibility for the physical and aesthetic quality of the total environment based on a knowledge of general ecological principles, an understanding of the impact of human society on the biosphere, and an awareness of the problems inherent in the environmental change. The underlying belief seemed to be that “if you provide people with accurate information about a situation, their values, attitudes, and behavior change for the better” (McInnis, 1975, p. 54), and this belief was enacted in the curriculum development strategies used by environmental educators. For the most part, they simply translated scholarly scientific material into subject matter to be taught and learned, generally through science education, because the construction of school environmental knowledge in the science curriculum was seen to be a direct outcome of scientific production.

However, during the 1970s, the goals and objectives for environmental education changed to emphasise more explicitly values and attitudes clarification, decision-making skills, and an action component, and it was increasingly recognised that the traditional formulations of the academic disciplines are individually inadequate for achieving the aims of environmental education. Environmental education was seen as requiring an interdisciplinary approach rather than a new or separate subject. For example, Buzzati-Traverso (1977) argued that:

The field under discussion is vast and multifaceted; it should be approached with a holistic attitude in that man [sic] and the innumerable components of his [sic] physical and cultural environment should be examined together in order to identify the complex and often hidden interactions that determine the pattern of human concerns. (p. 13)

These aspects of environmental education did not sit comfortably with conventional representations of science in science education as an objective, rational, and value free search for “one true story” (Harding, 1986, p. 193), and some science educators began to question the relationship between science education and environmental education. For example, Hall (1977) claimed “science teachers will do environmental education a grave disservice if they try to take it over” (p. 76). Others, including Greenall (1979) and Fensham and May (1979), argued for a closer relationship between environmental education and a reformed science education that they envisaged as being distinctly different from the version practiced in classrooms of the period.

Lucas (1980) adopted a different stance, expressing concern that “too many science educators seem to believe that their discipline is the vehicle for environmental education” (p. 1). He saw an “omnipotent disciplinary chauvinism” (p. 6) in assertions that science teachers could teach topics on society (beyond the social issues that arise from the application of science) – “will their worldviews as empirical experimenters

seriously distort the nature of historical understanding and aesthetic judgement?” (pp. 8–9) – and yet concluded that “science educators must not ignore the other forces acting to promote environmental wisdom, and must begin to look beyond the confines of their own and other educational literature for inspiration for research and practice” (p. 21). At that time, as now, many environmental educators were concerned with the political character of environmental problems and the implications of this for the type of education they were advocating. Their argument was that science and environmental education were incompatible and that environmental education could more appropriately be implemented in curriculum areas other than science, because the science curriculum of the time was inhospitable to engaging with social issues.

Concerns about the relationship between science education and environmental education have continued. For example, Ashley (2000) discussed the limitations of current science education practices and argued, “A scientific education for all that is more likely to result in [a more responsible attitude to science] therefore has to be a key objective for environmental education” (p. 275). More recently, Dillon (2016) has argued that, “Both science and environmental education can play a part in facilitating change and they must if we are to address global issues such as biodiversity loss, poverty and climate change” (p. 122).

As noted earlier in this chapter, in the 21st century, from an environmental education perspective, discussions about the relationship between science education and environmental education have almost been subsumed by the shift in discourse from environmental education to education for sustainable development. However, the importance of understanding the scientific concepts that underpin sustainable development continues to be re-affirmed. For example, the “environment” pillar of education for sustainable development is described as “an awareness of the resources and fragility of the physical environment and the effects on it of human activity and decisions, with a commitment to factoring environmental concerns into social and economic policy development” (UNESCO, 2004, p. 4).

From a science education perspective, environmental education continues to be the elephant in the room. A relatively recent review of science education in Australia (Tytler, 2007), whether intentional or not, neatly explicated the tensions in the relationship. In developing his argument for emphasising the “working scientifically” or “investigating” strands of Australian school science curricula, Tytler refers to the importance of citizens being able to engage with evidence in science in their personal lives and community issues – a central concern of environmental education:

By engaging in investigations that involve a consideration of what constitutes reliable and valid evidence and how this evidence is used to establish knowledge, students will gain important skills in a variety of ways of reasoning, and develop a capacity to make judgments about evidence in scientific argument. There are many social issues that involve appeals to scientific evidence, such as the effects of waste disposal policies on the environment, of tourism on the Great Barrier Reef, or of personal lifestyle factors on cancer risk. An understanding

of how such knowledge is generated and evaluated is therefore a powerful aim for science education. (p. 45)

In a similar vein, Jenkins and Pell (2006) concluded that:

Given that many environmental problems (and their solutions) are science related, there is clearly a role for school science education in such an engagement. However, environmental education is not simply a matter for science educators. To the extent that such education requires the accommodation of the personal, social, and economic with the scientific as an integral whole, it constitutes a challenge to a conventional subject-based curriculum and pedagogy. (p. 777)

Herein lies some hope for reconstructing science and environmental education for mutual benefit.

One reason for developing a different relationship between science education and environmental education arises from the need to respond to students' declining interest in science, despite their high levels of environmental concern and desire to know more about the environment. As Coffey (2008) reported from his investigation into young Australians' level of understanding and excitement about careers with a sustainability focus: "High school students are very aware of environmental issues and concerns ... They are hungry for credible, big picture, action oriented information/resources on long term environmental issues, especially on whether and how to respond" (p. 3). However, he also found that "school is a significant potential site for awareness and activism, though underdeveloped" (p. 4) and that "Students want practical, hands-on experience, "getting out" into the environment... [they] need to see how their own local, personal actions will contribute to the local picture" (p. 5).

Overcoming Resistance to Environmental Sustainability

All is not gloom and doom. There are examples of successful implementation of environmental sustainability in schools where there has also been better student engagement with their science education as well as educational, economic, environmental, and social outcomes for the students and schools.

Primary school teachers often struggle to teach science because they lack confidence and competence in science content, and they have difficulty finding a place for science in what they perceive as an already overcrowded curriculum. In contrast with this observation, Gough and Sharpley (2005) provided several stories of primary school teachers' and students' experiences of implementing new science teaching and learning strategies that have also led to more environmental education occurring in the schools' curriculum.

Another success story for science in primary schools is associated with the Australian Sustainable Schools initiative (DSEWPC, 2013) – although this was not necessarily the intended outcome. Sustainable Schools are the equivalent of Green

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Schools or Eco-schools in other parts of the world. Sustainable Schools take a whole school approach:

... whole-school approaches are advocated as best supporting the implementation of Environmental Education in a way that reflects the goals, aims, and purposes of this area ... Whole school approaches also appear to be most successful when they build on the existing culture, priorities, and values of schools and their communities. (Bolstad, Baker, Barker, & Keown, 2004, p. 95)

The Sustainable Schools initiative integrates changes to the practical operations of the school with sustainability issues in the curriculum and helps to build links to local communities. The four theme areas that are implemented are:

- “Waste” (waste and litter minimisation, green purchasing, recycling, and composting);
- “Energy” (energy efficiency, renewable energy, and reduction in greenhouse gas emissions);
- “Water” (water conservation, stormwater control, and freshwater ecology); and
- “School Grounds/Biodiversity” (developing a whole school Masterplan which may include indigenous gardens that attract native butterflies and birds, and special theme gardens and habitats).

Participating schools are able to choose all or some of the four optional themes. Each of these themes is science related and so the science content of the curriculum in Sustainable Schools – which are predominantly primary schools – is greatly increased as a result of an environmental education intervention. At the same time, the students have acquired relevant knowledge and skills related to environmental sustainability.

Similar positive stories about sustainable school initiatives come from many countries (Henderson & Tilbury, 2004). For example, the UK Sustainable Schools Alliance “encourages schools to put sustainability at the heart of their thinking”, however, although “commitment on the ground is strong, [it is] rarely part of mainstream practice” (UK National Commission for UNESCO, 2013, p. 17). For example, the UK Department for Education and Skills (2006) wanted all schools to be sustainable schools by 2020. In 2010, the government announced that they would no longer directly support the Sustainable Schools initiative in England “based on the belief that schools perform better when they take responsibility for their own improvement” (Hill, 2010, p. 1). A similar situation has happened in Australia where national funding for the Australian Sustainable Schools initiative was discontinued by the Australian Government in 2013, although some states are continuing to fund the state level programs.

Of course, science is not the only place for environmental sustainability in the curriculum. Geography has claims on the area too (ACARA, 2015b):

In a world of increasing global integration and international mobility, it is critical to the wellbeing and sustainability of the environment and society that young Australians develop a holistic understanding of the world ... (para. 1)

The Australian Curriculum: Geography empowers students to shape change for a socially just and sustainable future ... (para. 2)

Geography helps students to be regional and global citizens capable of active and ethical participation. (para. 4)

Indeed, in a context of global citizenship education, as developed in the Australian Curriculum, Geography would seem to be much better placed than Science for developing students' knowledge and skills to understand environmental sustainability and be global citizens. The English National Curriculum also includes sustainability and climate change in Geography (Department of Education, 2013). However, students also need to understand ecological processes and how human actions impact on these, which is recognised in many international documents such as *Our Common Future* (WCED, 1987) and the implementation scheme for the *United Nations Decade of Education for Sustainable Development* (UNESCO, 2004), both of which envisaged a positive role for science and technology and a relationship between scientific knowledge and environmental education for sustainable development.

For example, *Our Common Future* included statements such as “our technology and science gives us at least the potential to look deeper into and better understand natural systems” (WCED, 1987, p. 1), “the promotion of sustainable development will require an organized effort to develop and diffuse new technologies” (p. 87), and “unless action is taken to accumulate biological knowledge, valuable information ... will be lost forever” (p. 88). Education is given the task of providing “comprehensive knowledge, encompassing and cutting across the social and natural sciences and the humanities, thus providing insights on the interaction between natural and human resources, between environment and development” (p. 113).

Similarly, the Decade Implementation scheme (UNESCO, 2004) stated that:

The role of science and technology deserves highlighting as science provides people with ways to understand the world and their role in it. ESD needs to provide a scientific understanding of sustainability together with an understanding of the values, principles, and lifestyles that will lead to the transition to sustainable development. Science should be regarded broadly to include social sciences as well as natural sciences and traditional approaches to learning and understanding as well as formal science. (p. 16)

It is this broader view of science – incorporating social as well as natural sciences – in providing a scientific understanding of sustainability and developing informed global citizens that is a challenge for the future development of environmental sustainability in schools.

CHALLENGES FOR THE FUTURE

The post-Millennium Development Goals agenda (United Nations, 2013b) sets a number of challenges for education, but ones we cannot ignore. As the Introduction to the Decade implementation scheme stated (UNESCO, 2004):

There can be few more pressing and critical goals for the future of humankind than to ensure steady improvement in the quality of life for this and future generations, in a way that respects our common heritage – the planet we live on. As people we seek positive change for ourselves, our children and grandchildren; we must do it in ways that respect the right of all to do so. To do this we must learn constantly – about ourselves, our potential, our limitations, our relationships, our society, our environment, our world. Education for sustainable development is a life-wide and lifelong endeavour which challenges individuals, institutions and societies to view tomorrow as a day that belongs to all of us, or it will not belong to anyone. (p. 7)

The challenge for educators is to reconstruct our curricula so that our students, as citizens of the world, understand and respect the planet we live on. With respect to environmental sustainability, this means a different curriculum from that which we currently have – particularly the current version of the Australian Curriculum, which seems to be doing its best to remove sustainability from consideration.

Sadly, Australia and England are not the only countries to be treating sustainability, and related issues such as climate change, as the elephant in the room in education. Most countries need to make changes to their curriculum if we are to empower “learners to take informed decisions and responsible actions for environmental integrity, economic viability and a just society, for present and future generations, while respecting cultural diversity” (UNESCO, 2014, p. 12), and achieve a socially just and environmentally sustainable world.

NOTES

- ¹ Before continuing with this discussion I need to draw attention to a persistent practical problem for this chapter, namely, the frequent use of the term ‘man’ to refer to persons of both sexes in the early literature related to the environment and environmental education. This practice is a focus of feminist concern, however the frequent use of ‘[sic]’ in quotations from the literature is tedious. Therefore I will quote relevant passages from these texts, as appropriate, without the intrusion of ‘[sic]’ after each use of ‘man’, but readers should understand that such terminology is not my preference.
- ² The other four are: leave no one behind (“We can be the first generation in human history to end hunger and ensure that every person achieves a basic standard of wellbeing” [United Nations, 2013b, p. iv]), transform economies for jobs and inclusive growth (“We call for a quantum leap forward in economic opportunities and a profound economic transformation to end extreme poverty and improve livelihoods” [United Nations, 2013b, p. iv]), build peace and effective, open and accountable institutions for all (“We are calling for a fundamental shift – to recognise peace and good governance as core elements of wellbeing, not optional extras” [United Nations, 2013b, p. v]), and forge a new global partnership (“Perhaps the most important transformative shift is towards a new spirit of solidarity, cooperation, and mutual accountability that must underpin the post-2015 agenda” [United Nations, 2013b, p. v]).

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