

TEACHING ECO-LITERACY DURING A PERIOD OF UNCERTAINTY

A characteristic of the current global situation is that many of us believe that an environmental and developmental catastrophe is round the corner, whilst behaving as though all will be well. In this article, **Alan Peacock** begins by considering some ‘true-life parables’ that illustrate powerfully where previous communities have failed to heed environmental warnings. He then goes on to consider how best to learn in order to develop eco-literacy. The article proposes that ‘Collaborative Engagement’ strategies seem to work best, in which professionals with different expertise work together on a specific aim over an extended period of time. It addresses the difficulty of developing an appropriate eco-literacy curriculum, and suggests that key skills and attitudes are needed, including respect for evidence; understanding risk and predictability in relation to ethics; and communication skills and action competence. He concludes with a reminder that the key to long-term engagement and eco-literacy is to collaborate over extended periods with a focus on the right issues.

Introduction: ‘What do you do when you’re not sure?’

This is the opening line of the film *Doubt*, spoken from the pulpit by Father Flynn (played by Phillip Seymour Hoffman), knowing he is suspected of various misdemeanours. The words resonate, I suspect, with all of us engaged in education at the present time of uncertainty and a perceived need for change.

We are unsure about many things. The global economic system is in a precarious state; capitalist institutions are being questioned; funding for all educational enterprises is likely to be affected, but in ways we cannot predict, especially as we are no longer sure about where power and decision-making lies. The climate is changing faster than anyone predicted, and whilst this is certain now, what we are not sure about is where the greatest impact will be felt, how quickly we will be affected, who will suffer and how best to prepare for potential difficulties. Energy supply is also problematic; we do not want to rely on fossil fuels, but at present we have little choice. Debate rages about wind, tidal and wave energy, hydroelectric sources, nuclear power, the relative cost of these, and above all, ways to reduce the dependence on coal, oil and gas. Will there have to be rationing of energy?

How can we reduce our dependence on cars? Water is also likely to be the source of conflict, as droughts and climatic changes affect supply and access to clean, reliable sources and these become contested across international borders.

We are responding to these challenges in ways that suggest we may be in denial. Politicians emphasise the importance of reducing carbon emissions, but do little to make a significant difference. As individuals we stop using plastic bags, but continue to use far more than our rightful share of the world's energy resources, with developed countries emitting several tonnes of carbon dioxide a year. We carry on filling up landfill sites with rubbish, equivalent to about the weight of one buffalo each year per family, knowing that the methane generated from these sites is 20 times more dangerous than carbon dioxide in the atmosphere. We kind of believe that a catastrophe is round the corner, whilst behaving as though all will be well.

True-life parables

Two true stories illustrate the dangers we and our children face. The first of these is the story of the life and death of the community on St. Kilda, a small island off the west coast of Scotland. People lived on St. Kilda for centuries, keeping sheep on one rocky island whilst living on the other and harvesting gannets and their eggs for food, oil, bedding etc. Access to the eggs involved climbing up or down very steep and precarious cliffs; hence it became the role of the young, strong and healthy males. The community's lifestyle was sustainable as long as this section of the community was able to harvest the nests on the cliffs.

Two factors however reduced this sustainability. The first was the arrival of the Christian church, which discouraged work on Sundays, thus reducing productivity by one seventh, or about 15 per cent. The second and more pernicious influence, though, was the subsequent introduction of education. Teaching literacy and numeracy to the younger children was not in itself a problem; it became one, however, when the teachers encouraged the now-literate older children to leave the island for secondary and higher education. This deprived the island of the young men who were the only ones able to carry out the gannet harvesting, as well as being the potential future fathers of children, so the community's sustainability in terms of food, heating, lighting and reproduction was reduced to a level where only the very

old remained. The final 50 or so were eventually removed to the mainland in the mid 20th century, since when the island has been uninhabited, except by the staff of a radio station (Steele, 1975).

The second such cautionary parable relates to Easter Island, or Rapa Nui as it is known in Chile, of which it is a part. The island is 1,000 miles from mainland South America, and was first settled by Polynesians in the 6th century. The island was rich in palm trees, birds and fish, and the population steadily grew over 1,000 years, and then suddenly disappeared almost entirely, mostly as a result of starvation or violent deaths. This was not due to any natural disaster, but largely because of the islanders themselves. Rapa Nui is famous for its rows of massive stone heads, some over 10 metres tall, weighing many tons. They were carved as tributes to the ancestors who the people felt protected them, and were moved into place by the use of rollers made from the trunks of palm trees. As the population expanded, more carvings were made and more trees needed, until virtually all the trees had been cut down and could not regenerate fast enough. Fewer and fewer birds could nest as a consequence, so the birds and eggs on which they lived became scarce. Without trees they could not make canoes for fishing. Food shortages became so problematic that civil wars broke out and many inhabitants were slaughtered. Without canoes they could not emigrate to other islands. The few survivors learnt their lessons and shared what they had, until Dutch explorers arrived in the 18th century and brought European diseases, which wiped out the rest of the indigenous people. Only the giant stone carvings remain.

What and how to learn to develop eco-literacy: the evaluation base

The above stories emphasise the need for forethought and skills. Our children will need not only to anticipate and figure out what the problem is, but also have the skills, confidence, knowledge and interpersonal/management capabilities to be able to deal with problems as they arise. Starting from where we are now, in terms of teaching strategies and curriculum proposals, how can we set about supporting effective change that will move us in this direction? We must first take account of the professional and personal concerns of the teachers who are crucial in bringing about change, as Wenger explains:

“Workers organise their lives with their immediate colleagues and customers to get their jobs done. In doing so, they develop or preserve a sense of themselves they can live with, have some fun, and fulfil the requirements of their employers and clients. No matter what their official job description may be, they create a practice to do what needs to be done. Although workers may be contractually employed by a large institution, in day-to-day practices they work with- and, in a sense, for- a much smaller set of people and communities” (Wenger, 1998:95).

The evidence on which my conclusions are based come not only from a wide range of literature but also from evaluations of relevant eco-literacy programmes in recent years, including (in the United Kingdom - UK) the Eden Project in Cornwall, which evaluated programmes of school and family visits over several years (Peacock 2003b); the National Trust Guardianship Scheme (GS) for which two evaluations of short- and long-term programmes were carried out (Peacock, 2003c, 2005b); schools’ involvement with Soil Association programmes (Peacock, 2005a) and the Somerset Waste Action Programme (SWAP) which focused on waste minimisation and recycling across all schools in the county (Vrdlovcova, 2005). Overseas, we have carried out similar evaluations of primary teacher in-service programmes in Kenya, South Africa, Botswana, Namibia, Senegal and Sri Lanka (Peacock, 1999, 2003a; Peacock & Rawson, 2001; Levy, 1994). For reasons of space, these will not be discussed in detail but alluded to where relevant. Sources relating to reports on these evaluations are however to be found in the list of references and websites below.

How to develop teaching and learning of eco-literacy: what seems to work?

One feature common to successful eco-literacy programmes, both here and overseas, has been the Collaborative Engagement approach (Harvey, 1998). This approaches necessitates: *partnerships* in planning, teaching, evaluating; *serial involvement* over extended periods of time; *communication systems* that work (e.g. email, chat rooms); *mutuality* in accepting we are all learning; and a *focus* that has relevance and interest to children. And crucially, the question, *what’s in it for us?* (i.e. the teachers), must always be addressed.

This approach evolved within the Primary Science programme (PSP) in South Africa (www.psp.org.za), from a philosophy based on negotiated co-operation between teachers and professional ‘implementers’, and from the experience that one-off seminars and workshops alone do not achieve lasting changes in classroom practice.

The approach therefore involves:

- Modelling best practice (by professional ‘implementers’);
- Facilitating needs analysis by all those involved (including learners);
- Collaborative planning between teachers and professional implementers;
- Development of innovative resource materials (e.g. ‘Spider’s Place’ comics:
<http://www.unesco.org/education/catalogues/sitevideo/themes/primary.htm>);
- Team-teaching lessons involving ‘safe practice’ for teachers;
- Mediating critical reflection and problem-solving, and coaching teachers in safe feedback;
- Promoting action research (e.g. on resource management);
- Formulating school policies;
- Providing ongoing support for teachers; coaching for application.

Collaborative Engagement strategies are also dependent on an analysis of the stage of the school’s evolution, the school’s political climate, its geographic distribution, and the number of schools a single implementer has to service (Harvey, 1998).

As a consequence, our evaluations identified considerable success in ongoing programmes such as the GS and the SWAP programme, both of which had involved partnerships and collaboration over many years that allowed environmental experts to work with children and teachers both in school and at their specialist sites on a regular basis. In contrast, visits to the Eden Project, despite the hugely exciting and stimulating nature of the venue, had little long-term impact on children’s understanding of key eco-literacy concepts (such as the interdependence of plants and people) since visits tended to be ‘one-off’ with little preparation or follow-up. The approach of more successful approaches has been summed up in the work of Michael Roth:

“Rather than preparing students for life in a technological world, I work with teachers to create opportunities for participating in this world and for learning science in the process of contributing to the everyday life of the community...Early participation in community-relevant practices provides for continuous participation and a greater relevance of schooling to the everyday life of its main constituents” (Roth, 2003).

The conclusions of this section are based on a wide range of research. Projecting what might work in curriculum terms is, however, much more of a crystal-ball activity, since much depends on the way any new idea is interpreted. ‘Innovation without change’ has been a feature of much curriculum development for the past 40 years or more. So it is important to proceed with caution, and to treat what follows as speculation, albeit of those involved in this field over many years.

Appropriate skills and attitudes

An appropriate eco-literacy curriculum should at least incorporate essential skills and attitudes as well as knowledge. In this respect, the following key areas are crucial, namely:

Respect for evidence rather than uncritical acceptance. For example, a recent article in *The Times* on ‘Rising sea levels’, said:

“[In] the Carteret islands off Papua New Guinea, the anarchic nation of mountains, jungles and islands, the last tide could come at any time. Then these islands at the ends of the earth will simply vanish...the low lying atoll seems doomed...Every year the tidal surges are becoming stronger and more frequent; the Carterets are a portent of catastrophe to come” (*The Times*, March 2007).

The emotive language aside, I decided to check out these claims against reputable science websites, and discovered that the islands were indeed becoming swamped by the sea, but not as a consequence of rising sea levels, which are currently insignificant. The problem was actually a creation of the islanders themselves, who were dynamiting the reefs for coral and cutting the mangroves for fuel, both of which exposed the islands (which only rise 1.5 m

above sea level anyway) to big waves, which then also undermined the beach-front palms and allowed the sea to surge in (Peacock, 2007).

Any teacher could have helped their class to identify relevant websites to check this information in a very short time. Children should therefore learn to question what they find in the media and understand the difference between authentic evidence, opinion, bias and prejudice, as well as having the skills to find and assess relevant websites.

Understanding risk and predictability in relation to ethics. If you ask a child which is the most dangerous, a chair or a shark, they will almost inevitably choose the shark. But there are many times more fatalities arising from the use of chairs than encounters with sharks- the latter running at two or three a year at present worldwide. Two key dimensions to distinguish therefore are *risk* and *predictability*. A future event can be any of the following:

- *Low risk, easy to predict:* e.g. more people are going to use mobile digital technology;
- *Low risk, hard to predict:* e.g. there will be very cold weather next winter;
- *High risk, hard to predict:* e.g. there will be a huge earthquake soon in California; and
- *High risk, easy to predict:* e.g. more people will contract life-threatening diseases such as HIV/AIDS.

Risk and probability also relate to the teaching of ethics, since if something is high risk as well as high probability, then we feel morally obliged to do something about it, such as climate change. Children are usually extremely keen to address such issues, though many teachers may still find this the most difficult aspect of their work.

Communication skills and action competence. There has been a high emphasis on literacy in the primary phase in recent years, though in the UK this has tended to focus on reading and writing, to the detriment of listening and speaking. Robin Alexander's (2001) ground-breaking study compared (amongst other things) children's ability to communicate orally

across various countries, and showed that UK and United States' (US) learners used significantly less oral communication in school than those from France and Russia. Such skills are crucial in relation to what has been called action competence, i.e. the skills needed to get things done and achieve change.

Our studies of the GS, SWAP and others also showed that the earlier children are introduced to these skills in relation to environmental concerns, the more likely they are to be effective change agents, at home as well as in school. This has also been observed in South African primary schools, where collaborative engagement between UK trainee teachers and school staff has continued for many years, leading to a wide range of initiatives both in the school and overseas, including school choir tours to the UK, for example, which raised money to build classrooms, library and computer suites (<http://www.pembec.wigan.sch.uk/sitho/>).

This article has so far described the importance of skill and attitude development to support eco-literacy but what of the knowledge base that children might need? There are some obvious areas that are perhaps already gaining more attention, such as energy conservation measures, renewable energy sources, waste minimisation and technological literacy. All of these need to be brought into what might be called the core of the curriculum, rather than left to be championed by enthusiastic teachers and environmental charities. 40 years ago in Kenya, for example, the whole science syllabus for the final year in primary school focused on 'making work easier' and set out to help children make tools and construct systems for being increasingly self-sufficient. One school visited built its own windmill and used it to saw wood as well as generate power (Githinji, 1992). However, many teachers felt inadequately trained and confident to tackle this curriculum, and this remains a challenge, not only throughout Africa and other developing areas, but across the developed world.

The specific ways in which the above curricular foci can be articulated are already established, if not widely taught. But we will need other knowledge and skill-sets for the future. My proposition is that these might include increased emphasis on the following:

Family health and disease prevention. We have in recent years seen media panics over the measles, mumps and rubella vaccine, e-coli, bird flu and currently swine flu. Each of these clearly presents health risks and

challenges, but knowledge about the actual threat is harder to come by. The 'Healthy Schools' initiative in the UK has made some impact through its aim to offer:

“close support and guidance to primary care trusts, local authorities and their schools,...equipping children and young people with the skills and knowledge to make informed health and life choices and to reach their full potential” (<http://www.healthyschools.gov.uk>).

The initiative has reached the majority of schools. Sexual health education is, however, still optional in UK primary schools, and this situation leaves serious gaps in children's understanding. Climate change alone will present a considerable challenge to health, in terms of heatstroke and skin cancer for example, as recent heat-waves across Europe has demonstrated.

Access to and conservation of clean water supplies. Water has been labelled the 'new oil' given its importance as a resource, and is likely to be the focus of future conflict as droughts, melting glaciers and over-extraction in some places begin to have an effect on access to water supply. The rivers rising in the Himalaya and Tibetan plateau (Indus, Ganges, Brahmaputra, Mekong, Yangtze and Yellow Rivers) sustain half the world's population, and yet their sources straddle contentious international borders between India, Pakistan, China, Nepal and Tibet. Their glaciers, the largest outside the poles, are melting at twice the global average. This will initially mean floods, followed by rivers eventually being reduced to a relative trickle to dramatic effect, especially in areas like Pakistan which already suffer from great political instability (Lynas, 2007). Similar scenarios can be anticipated in the Middle East (Syria, Lebanon, and Israel) and Africa.

The other important reason for focussing on water is that it offers a good example to young people of the benefits of studying an issue that is absolutely familiar in their local environment yet relevant in an international, inter-cultural context. A major challenge in coming years will be to help young children escape the mind-set of many of the older generation, who (in the UK in particular) so often see themselves as separate from Europe, as well as the rest of the world, and do not always grasp the global implications of environmental issues. The generation born in the 1940s and 1950s has been largely immune from major catastrophes, and has in many ways come to see a comfortable life-style as their right. Young children are unlikely to

have this benefit, and need their horizons widened regarding the key issues that will impact on their lives. This is where ‘knowing what to do when you’re not sure’ will be essential.

Gardening, food, cooking and increased self-sufficiency. A corollary of this is the need to be more independent, in energy, food, transport and all the other day-to-day necessities that people depend on. In the UK there has been a recent increase in the number of people acquiring allotments and growing their own (organic, genetically modified-free) food. Initiatives such as the Garden Organics movement (<http://www.gardenorganic.org.uk/organicgardening/schools.php>) have helped many schools start their own gardens and have encouraged teachers and children to learn the skills involved first-hand, as well as providing produce for school kitchens and encouraging healthy meals, packaging-free packed lunches, etc. The eco-schools movement (<http://www.eco-schools.org.uk/>) has also encouraged schools to raise the profile of energy efficiency, the use of ‘walking buses’, planting trees and other methods of engaging children actively in reducing carbon emissions. But the latest proposed revision of the primary curriculum in England, for example, does not make these matters a statutory component of classroom practice. Information communication technology (ICT) on the other hand has been elevated to core curriculum status, at the expense of science and the environment (<http://www.dcsf.gov.uk/primarycurriculumreview>). The implications of these proposals will, sadly, not be lost on teachers and could have far-reaching consequences for young people.

Environmental attentiveness. The Indian philosopher and spiritual teacher Krishnamurti always proclaimed ‘attentiveness’ as a key aspect of understanding and coming to terms with life. Problems, he would say, arise from seeing the world fragmentarily. Encouraging young people to be attentive to their surroundings and to the natural environment in particular is not easy, in an age of ubiquitous mobile technology that in many ways isolates children dangerously from their surroundings. Yet our work with children and trainee teachers makes clear that it is perfectly possible to retain young people’s attention given the right conditions. Taking trainee teachers to a forest where they feel initially disoriented and perhaps lost, and asking them to spend a short time silently on their own, has prompted some quite astonishing reflection and writing, as has taking children to empty beaches, high hills, wetlands or other unfamiliar locations (Peacock &

Bowker, 2004). Many of the ‘earthwalk’ activities promoted by Joseph Cornell (1989) and Steve van Matre (1999), for example, successfully engage children in becoming attentive and highly aware, as evidenced by the creativity that ensues.

Recently, the ‘Learning Outside the Classroom’ agenda in England has happily begun to reverse the trend away from outdoor learning owing to a combination of factors such as lack of time, pressures of assessment and fears of litigation in case of accidents. However, there is still a lot of progress to be made, and many people still see off-campus work as ‘school trips’ rather than opportunities to deepen children’s awareness of their surroundings.

Simple activities for children; the shock of the unexpected

Cornell and van Matre have suggested that children’s curiosity is best engaged by experience of the unexpected; and I will use four simple activities to illustrate this.

1kg of greenhouse gas. Wrap a 1kg bag of sugar or flour in plain paper, labelled ‘1kg of greenhouse gas’. Pass it round, and ask children how far their car has to travel to put this weight of carbon dioxide into the air. (The actual distance, for an average family saloon, is about 7km). They are likely to be very surprised.

Melting ice-caps in the classroom. You need two glasses of ice with a little water, and two thermometers; or preferably, two temperature sensors connected to a laptop. Ask the children to predict how the temperature will change as the ice melts. As they watch the read-out, they may be surprised to find that the temperature does not change at all until all the ice has melted, after which it rises quite quickly. You can then discuss the implications of this exercise for the melting of the north polar ice cap. To extend this activity, repeat the experiment with some reflective surface (e.g. a piece of tin foil) on top of a glass. How does this ability to reflect light and heat affect the melting of the ice?

Halving your budget. Present the children with a list of six things that your council could do to reduce the amount of waste going to landfill, and give a rough costing for each. Ask the children to decide which idea should take precedence, but first, tell them that their budget is only half of

that needed to do all of the things proposed. This generates debate and the important skill of agreeing on priorities, as real councils have to do.

The oil sandwich. You will need a sandwich from a shop, in its triangular plastic case, and a bottle of oil. The ‘deal’ is, they can have it free if they are willing to fill the container with oil and drink that too. They will of course be disgusted by this; you can then ask them how oil was used in the making of the sandwich, from planting seeds to growing wheat, greenhouse heating for tomatoes and salad greens, feeding the pigs for the ham, harvesting, transporting, preparation, distribution, refrigeration etc. It is more oil than could fill the triangular container!

Conclusion

“In the coming decades, the survival of humanity will depend on our ecological literacy - our ability to understand the basic principles of ecology and to live accordingly. Thus, ecological literacy, or ‘eco-literacy’, must become a critical skill for politicians, business leaders and professionals in all spheres, and should be the most important part of education at all levels - from primary and secondary schools to colleges, universities and the continuing education and training of professionals” (Capra, 2002:201).

We are still a long way, in the UK at least, from achieving this, though awareness of its importance is gaining ground. Our research shows clearly that the earlier children are presented with these issues and ways of learning, the more impact they make on their practice in school and outside; for example, 5-6 year-old children learning about recycling, composting and cutting out waste in school not only carried these messages home but put pressure on parents to act accordingly (Vrdlovcova, 2005). There is evidence from the Guardianship Scheme long-term impact study (Peacock, 2005b) that children engaged in collaborative environmental programmes at National Trust sites when at school continued to champion these causes into adolescence, work and beyond.

But the key, according to our research findings, is to focus on the right issues, collaboratively over an extended period of years, on a regular basis, so that the complementary skills and commitment of teachers and other environmental professionals demonstrate to learners that these things not

only matter but are worth prioritising, in school and in their lives outside. Eco-literacy needs to become central to education, including teacher education and its learning extended into behavioural change that will address the global environmental issues confronting our planet. Without this practical application and behavioural change, eco-literacy, like scientific literacy, will be seen as an option for specialists or enthusiasts, with all the damaging implications that might ensue.

For example, our pupils may be required to address issues such as those raised recently by the Institute of Mechanical Engineers:

“As global emissions are not reducing and the climate is changing, the more pragmatic approach, as suggested by the Institution, is that only by adapting our behaviour can we hope to secure long term human survival. We have to look at how engineers might help our world to adapt to changes over the next few centuries. [In this report] four areas of engineering are considered under the above climate scenarios: energy, water, buildings and transport, and how they will need to be adapted to deliver a more resilient and robust adaptive management system” (Institute of Mechanical Engineers, 2009).

As James Lovelock has recently said, ‘It is not about saving the planet - earth will look after itself. It is about saving humankind’ (Lovelock, 2009).

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Alan Peacock is Honorary Research Fellow at the Graduate School of Education, University of Exeter, UK. He holds a doctorate in Philosophy in environmental education from the University of Ulster, and has worked extensively in developing countries, particularly Africa, as teacher educator and evaluator of educational programmes. His most recent book is *Eco-literacy for Primary Schools* (Trentham Books). He is also currently chair of a UNESCO group developing 'Guidelines for enhancing quality education through textbooks and learning media'.