

Environment, Ethics and Cultures

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Scope

Technology Education has gone through a lot of changes in the past decades. It has developed from a craft oriented school subject to a learning area in which the meaning of technology as an important part of our contemporary culture is explored, both by the learning of theoretical concepts and through practical activities. This development has been accompanied by educational research. The output of research studies is published mostly as articles in scholarly Technology Education and Science Education journals. There is a need, however, for more than that. The field still lacks an international book series that is entirely dedicated to Technology Education. *The International Technology Education Studies* aim at providing the opportunity to publish more extensive texts than in journal articles, or to publish coherent collections of articles/chapters that focus on a certain theme. In this book series monographs and edited volumes will be published. The books will be peer reviewed in order to assure the quality of the texts.

Environment, Ethics and Cultures

*Design and Technology Education's Contribution to Sustainable
Global Futures*

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2. ENVIRONMENT

Contributions of Design and Education to the Sustainment of Planet Earth

INTRODUCTION

Any book that aims to deal with issues of sustainable futures will necessarily have a significant focus on environmental sustainability. Historically, concerns over sustainable futures were predominantly focused on the environment, with references going back as far as, for example, the 7th century when legislation was introduced to protect birds in the Farne Islands off the north east coast of England. More recently there has been recognition that sustainable futures depend on complex sets of relationships. Frequent reference is made to what are termed the (ubiquitous) ‘three pillars of sustainability’: environment, society and economy. Alternative models that unpack this complexity include ‘four circles of sustainability’: ecology, culture, politics and economics (United Nations Conference on Environment and Development, 1992) and Forum for the Future’s ‘Five Capitals’: Natural capital, social capital, human capital, financial capital and manufactured capital (Porritt, 2005). Whatever the model, there is recognition that sustainment of the environment – planet Earth – is non negotiable. While the dependencies of sustainable futures may be complex, without environment the pillars of society and economy will crumble.

This chapter will explore early developments of concern for the environment and of what has come to be called ‘environmentalism’. This will lead to an exploration of how these concerns have come to highlight the importance of environmental education and, more recently of education for sustainable development. Alongside this will be a focus of the particular role that design and designers play in environmental issues. Finally the collective issues will be explored in relation to how they impact on the way in which Design and Technology education can play a positive role in preparing young people to contribute to environmentally sustainable futures.

ENVIRONMENTALISM

With the emergence of industrialisation came a concern from individuals within societies for how industrialisation, and the related issue of consumerism, has impacted on the environment. These individuals have, variously, grouped together to create a social movement referred to as environmentalism. We often think of this as being a phenomena that emerged in the 20th Century, spearheaded by activists and writers such

as Aldo Leopold (1949), Rachel Carson (1962) and Donella Meadows (Meadows et al., 1972), but modern environmentalism can be seen in earlier, 19th Century activism – for example in the UK by people such as John Ruskin and William Morris and in the USA by people such as Henry Thoreau. This activism has led to important legislation, for example in the protection of various species and in anti-pollution laws. Environmentalists have also made visible issues that have created, for some, a sea-change in the way the world is viewed and for others a resistance to change wherein presenting issues such as climate change are seen as propaganda, a threat to the status quo and often a threat to the protection of personal interest. Laying bare the negative ecological, sociological, cultural and economic impacts of environmental degradation has sometimes been seen as presenting ‘doom and gloom’ scenarios. In a prominent analysis of environmentalism Shellenberger and Nordhaus (2007) identify what they see as recent failures in the movement. The authors suggest that there has been too much ‘laundry listing’ of disaster scenarios and too little positive vision of the benefits that action to protect the environment can bring. Despite the ubiquitous nature of what Shellenberger and Nordhaus describe as nightmare (as opposed to dream) scenarios, the general public’s imagination and interest in sustainability-related issues has been captured, for example as witnessed by the increase in sales of products labelled ‘fair trade’, the numbers of copies of texts such as Naomi Klein’s ‘No Logo’ (2000) being sold, or the number of viewings of Al Gore’s 2006 documentary ‘Inconvenient Truth’. But even with the growth of understanding of imperatives for sustaining the environment making their way into what might be seen as popular culture, the harsh reality is that the wisdom of early environmentalists has yet to be realised in the majority of human activity. Looking back at early writings, there is a clear history of concern for the impact of human development on the environment. But what is also clear are the ways in which impacts from changes in the environment are like the ripples of a stone in a pond as they circle out to affect so many further aspects of life.

David Orr (2002), referring to the writing of Smil (1994) identifies an issue at the core of challenges to creating ecologically sustainable futures.

The perennial problem of human ecology is how different cultures provision themselves with food, shelter, energy, and the means of livelihood by extracting energy and materials from their surroundings. (Orr, 2002, p.14)

He goes on to make the link to the fundamental role of design in human ecology.

Ecological design describes the ensemble of technologies and strategies by which societies use the natural world to construct culture and meet their needs. Because the natural world is continually modified by human actions, culture and ecology are shifting parts of an equation that can never be solved. Nor can there be one correct design strategy. (Orr, 2002, p.14)

Taking this discussion one step further he captures a critical reality of the complexity of human ecology – that to focus exclusively on the environment is to ignore relationships with other societal implications.

How and how intelligently we weave the human presence into the natural world will reduce or intensify other problems having to do with ethnic conflicts, economics, hunger, political stability, health, and human happiness. (Orr, 2002, p.14)

Recognition of the importance of seeing environment in a broader context is highlighted by the increasing shift to focus on sustainability, of which environment is one element – as indicated at the start of this chapter. Viewing sustainability through an environmental lens recognises the complex relationships of sustainability whilst exploring aspects that either derive from or impact on the environment.

Worldviews

An environmental lens has enabled a range of crucial aspects of sustainability to be unpacked, not least an understanding of the impact of different worldviews. Broadly speaking, two overarching and contrasting perspectives demonstrate a fundamental difference: anthropocentrism, which takes a human centred view of environmental issues - predominantly concerned with the impact of environmental issues on humans; and ecocentrism, which takes an ecological view. The former is more prevalent in westernised positions in which humans are supreme and arguments for environmentalism focus on the ultimate goal of human wellbeing. The latter can be illustrated by the ethical position of Aldo Leopold (1949) who took an ecocentric position in which a human is seen as a ‘plain member’ and citizen of the land, not its controller or conqueror. For many environmentalists who subscribe to an ecocentric perspective, anthropocentrism is a root cause of environmental problems. This position is presented clearly by Rowe (1994).

Because “environment” means that which encircles something more important, literal “environmentalists” are willy-nilly anthropocentric, placing less value on the surrounding world than on humanity and self. If that causes uneasiness, the central position of the self can be retained painlessly by redefining it as a broad field-of-care embracing Earth. But this is an ineffectual gesture if, when push comes to shove, humanity is always accorded top billing. ... It is time to eschew human self-interest and recognize the inherent worth and surpassing values of Earth's miraculous ecosystems whose workings we do not understand. *Anthropocentrism says we know how to control and manage them; ecocentrism says ‘not yet; maybe never.’* (Rowe, 1994, p. 106)

This latter position is also at the basis of what is described as deep ecology – a movement that draws from the writings and ideas of Aldo Leopold and Rachel Carson, and initiated by Arne Naess (1973), that recognises complexity and interconnectedness; a holistic viewpoint. Deep ecology also builds on spiritual and philosophical traditions that have resonance with religions such as Buddhism and indigenous cultures such as those within Native Americans. The holistic stance

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creates a more pluralistic view of environment and also provides a useful tool for critiquing approaches to design and also to Design and Technology Education – both of which we will turn to later. But first we turn to education – and the ways in which the growth in focus more generally on environmental issues has been paralleled by the growing importance that has been placed on bringing such issues into the arena of education.

ENVIRONMENTAL EDUCATION TO EDUCATION FOR SUSTAINABLE DEVELOPMENT

Historically, concerns for the environment have emerged in the curriculum under headings such as ‘conservation education’ and ‘environmental education’ – both areas largely linked to subjects such as biology and geography. The Environmental Education movement developed strongly through the 1960s, 70s and 80s, with landmarks such as the Stockholm Declaration (UNEP, 1972), The Belgrade Charter (UNESCO-UNEP, 1976) and the Tblisi Declaration (1977, ref), building commitment and then more detailed goals, objectives and principles for Environmental Education across nations and supported by United Nations Environment Programme (UNEP) and also by the United Nations Educational, Social and Cultural Organisations (UNESCO).

Writing in the early 1990s, Huckle refers to the lack of impact of the early years of environmental education and makes the case for the shift towards a focus on sustainability that “must be grounded upon an appreciation of the root causes of environmental problems in the global economic system” (Huckle, 1993, p.43). He describes Environmental Education as existing in three forms: education for environmental management and control; education for environmental awareness and interpretation; and education for sustainability. At the time of writing he saw the first of these dominating classrooms and curricula, but emphasised the importance to a shift towards the latter that he describes as that “which predominantly serves the critical human interest, is based upon critical science, and coheres most closely with the notion of education *for* the environment” (Huckle, 1993, p.63).

Over the last two decades there has been considerable debate about the labels of Education for Sustainable Development, Education for Sustainability and even Education for Sustainable Living (which has an implicit focus on individuals, rather than policies). What is clear across all of these is the broadening of the debate around sustainability that goes beyond a specific environmental focus to see this in the wider context of economic, political, cultural, social and ethical issues. Policy development, led largely by the United Nations, has been a major factor in setting the agenda for development and key landmarks in terms of education have run in parallel with broader discussions of environment, development and sustainability. These landmarks have seen the qualification of goals and objectives for Environmental Education (as mentioned above) and also for a shift in focus to Education for Sustainable Development (ESD), the latter being signposted by the Bruntland report

(1987) and being presented more fully in 1991 (in terms of policy) as a result of the Rio Summit through Agenda 21 (United Nations Conference on Environment and Development, 1992). Despite developments after 1991, by the early years of the 21st Century there was concern for regeneration and further development of ESD. One concern was that, despite what was seen as the broader perspective of ESD (for example as including the pillars of economic, social and environmental sustainability), there was a perceived need to re-orientate from an ongoing focus on Environmental Education. As a result the Decade of Education for Sustainable Development (2005-2014) was launched with a clear aim to

Integrate the principles, values, and practices of sustainable development into all aspects of education and learning. This educational effort will encourage changes in behaviour that will create a more sustainable future in terms of environmental integrity, economic viability, and a just society for present and future generations. (UNESCO, 2005, p.6)

The brief history above implies one of consensus, both about the aims and scope of ESD and also that its prominence presented a welcome and progressive shift from EE. The reality presents a different picture. Exploring some key ideas and themes in different perspectives allows a clearer understanding of the position of environment within debates and also insights into important considerations in moving forward in terms of sustainable futures.

Debates, Perspectives on EE and ESD

Pavlova (2013b) discusses the shift from EE to ESD that came partly through policy developments at UNEP and UNESCO but also cites those who didn't see ESD as the successor to EE as a better way to deal with socio-environmental issues. She makes a case for both, by considering their potential in terms of transformative learning. Sterling (2001) describes transformative learning as "third order" or "deep" learning that is when "we are able to see things differently ...involv[ing] a deep awareness of alternative worldviews and ways of doing things". He contrasts this with first order learning that "takes place within accepted boundaries; ... is adaptive learning that leaves basic values unexamined and unchanged" and second order learning that "involves critically reflective learning, when we examine the assumptions that influence first-order learning" (Sterling, 2001, p.15). All three types of learning are needed in different situations but it is the "shift of consciousness" that Sterling considers is needed "that radical movement towards sustainability requires" (p.15).

Pavlova uses transformative learning as a lens to analyse pedagogical approaches in EE and ESD, as expressed at policy level, and sees many similarities such as

an emphasis on life-long learning and inclusion of formal and non-formal education; interdisciplinarity; inclusion of social, environmental and economic realms; and use of a variety of pedagogical techniques that promote

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participatory learning, first-hand learning and development of higher order thinking skills. (Pavlova, 2013b, p. 667)

She does highlight however a significant difference in the way in which they differ, for example with EE focusing on local-global links related to the learner's own community as opposed to ESD that embeds learning into contexts that support capacity building within communities and a focus on socio-ecological structures. In focusing on policy she also acknowledges the reality of policy and practice not always lining up.

She identifies a significant difference in worldview between the two, as expressed by the concern of EE advocates that ESD is largely driven by capitalistic views and an anthropocentric stance, including the perspective presented through UN policies and reports. This point is also made by Bonnett (2013) who sees this position being present in early key documents, including the Brundtland Report (United Nations, 1987), a document often seen as setting down leading principles for sustainability.

Kopnina (2013), writing from environmental anthropology refers to the difference as "the 'elephant in the room', namely robust anthropocentric bias" (p.609). She distinguishes anthropocentrism as being either self-interest or altruism but still considers the stance to display "moral human superiority" (p. 610). Analysing current discourse on ESD she identifies no more than passing reference to ecocentric views or ethics and concludes that in some policy documents the priorities are clearly economic and social – environment coming a poor third and only in relation to environmental care in respect of the wellbeing of humans.

Further internal debates include a critical theory and eco socialism paradigm presented by Huckle (1993) that contrasts with Webster's systems thinking, ecological worldview, explored through the new economics of the concept of a circular economy (Webster, 2007). Stephen Stirling also advocates an ecological worldview and a holistic approach, seeing this as a "shift of emphasis from relationships based on separation, control and manipulation towards those based on participation, empowerment and self-organization" (Sterling, 2001, p.49). The focus on a holistic perspective has resonance with David Orr's concern for an ecological literacy that emphasises not disciplines and knowledge, but wisdom and the education of the whole person (Orr, 2004) and Michael Bonnett who introduces the importance of

sustainability as a frame of mind [that] is not simply the issue of our attitude towards the environment, that represents a perspective on that set of the most fundamental ethical, epistemological and metaphysical considerations which describe human being; a perspective which is both theoretical and practical in that it is essentially concerned with human practices and the conceptions and values that are embedded in them. (Bonnett, 2002, p.14)

Writing in 2013 and reflecting back on the development of EE and ESD, Bonnett presents a position where EE is the more inclusive and broader of the two and makes a case for ESD to be re-located into EE to make it more effective. His argument is

that ESD is too instrumental and that to embed it into EE would allow for a less anthropocentric, economic approach and would provide room for the spiritual and aesthetic, “in which the intrinsic worth of the natural world is respected” (Bonnett, 2013, p.252).

Vare and Scott (2007) have undertaken a different approach by presenting what they see as two different perspectives of ESD – one that promotes “informed, skilled behaviours and ways of thinking” and a second that builds “capacity to think critically about what experts say and to test ideas, exploring the dilemmas and contradictions inherent in sustainable living”. In making this distinction they are actively avoiding an either/or debate but seeing a need for both – the ying and yang of sustainability that allows for short term actions and long term learning.

The above perspectives on EE and ESD are presented to give some understanding of a range of views on how education can contribute to sustainable futures. Laying out some breadth and providing some insight into the conflicts in different viewpoints provides a context through which to explore the related developments in Design and Technology and what is largely unrealised potential, as will be discussed in detail later in this chapter. But of equal importance are the writings and practices of designers concerned with issues of environmental sustainability and it is to these that we now turn.

DESIGN, SUSTAINABLE DESIGN AND THE ENVIRONMENT

Consumption and the Product Paradigm

The Industrial Revolution heralded an age of consumption never before witnessed and set in motion an era of production that has grown massively, like a snowball rushing down a hill, to a point where the desire to possess more and more stuff has become an addiction that has caused massive impact on the environment both in the depletion of resources and the creation of (often toxic) waste products. In describing designerly thinking as “one of the most dangerous of all human characteristics”, Ken Baynes highlights the role of designers in contributing to the mass expansion of production in the ‘developed world’ of “taken for granted products and services”. He makes the point that extending these practices to all humans would likely cause “catastrophic environmental collapse” (Baynes, 2009, p.5). While designers are not the sole culprits here, the ways in which designers have become collaborators in the development of a product paradigm based on desires and wants rather than needs have contributed the creation of (paraphrasing the words of Stan Laurel) the fine mess a section of the world’s population have got us into.

Unlike the haphazard antics of Laurel and Hardy, the development of a paradigm of consumption came from planned activity, as was highlighted over fifty years ago by Vance Packard (1960) in his important text ‘The Waste Makers’ in which he lays bare the marketing machinery created to produce and sell more and more of things we didn’t (and still don’t) need. In a book dedicated to his parents “who have

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never confused the possession of goods with the good life” (p.5), he describes his nightmare scenario of an over-producing America, driven by an economic strategy fuelled by design for obsolescence and aggressive marketing policies.

While there is plenty to witness globally that suggests that no lessons have been learnt from Packard’s analysis, slowly but surely groups of designers have recognised the power of design for bad and also for good. Launched in 1964, a few years after Packard’s text, the ‘First things First’ Manifesto (<http://www.designishistory.com/1960/first-things-first/>) pinpointed the need for graphic designers to use their talents for less consumerist purposes. A re-issue of the manifesto by a range of publications in 1999 (Adbusters, AIGA, Blueprint, Émigré, Eye, Items) made this point clearly, stating

In 1964, 22 visual communicators signed the original call for our skills to be put to worthwhile use. With the explosive growth of global commercial culture, their message has only grown more urgent. Today, we renew their manifesto in expectation that no more decades will pass before it is taken to heart. (Garland et al., 1999)

In highlighting the many talents of designers, Papanek (1995) stressed the need for an explicit shift in practices.

Both time and place give designers the confidence that the skills and talents that we bring to our work will continue to be valuable in the futures to come. Yet this must make us extremely careful about what we design and why. The changing environment of our fragile planet is a result of the things that we do and the tools that we use. Now that the changes that we have brought about are so major and so threatening it is imperative that designers and architects play their part in helping to find solutions. (Papanek, 1995, p.8)

Sustainable Design: Policies, Reports, Principles and Practices

This shift had already emerged at a policy level through the Hanover Principles (McDonough & Partners, 1992), principles on design for sustainability developed as guidance for the preparations for the Hannover World’s Fair in 2000. The Principles are based on a clear definition, building on Bruntland, but explicitly taking an ecocentric stance. This is indicated from the outset, stating that the principles

Insist on rights of humanity and nature to co-exist in a healthy, supportive, diverse and sustainable condition. (McDonough & Partners, 1992)

Following from this they address issues such as designing for interdependence between humans and nature, respecting relationships between spirit and matter, focusing on long term solutions, understanding the limitations of design and eliminating the concept of waste. The latter is a theme developed through the concept of ‘cradle to cradle’ designing (McDonough & Braungart, 2002) but also picked up

earlier in McDonough's Centennial Sermon (1993) through his categorisation of consumables as "products that when eaten, used, or thrown away, literally turn back into dirt and therefore are food for other living organisms" (p.5). His view is that we should be designing and making more of these, as opposed to what he categorises as "products of service" such as cars, TV, that are only hired, not sold, and eventually return to the producer for disassembly and re-use. His third categorisation is what he terms "unmarketables" – things that shouldn't be designed and sold in the first place because of the impact they have on the environment.

A more recent set of principles are those that have emerged from the American Institute of Graphic Arts (AIGA) – the Living Principles for Design (www.livingprinciples.org) - that aim to provide clear and action-focused guidance on integrating sustainability into design. Seen as both a toolkit and a roadmap, the principles are structured around culture, environment, people and economy. A further set of guidance comes from the idea of Slow Design Principles (Strauss & Fuad-Luke, 2008). Fuad-Luke characterises slow design as

An approach that encourages a slower, more considered, and reflective process, with positive well-being for individuals, societies, environments, and economies. Slow design positions itself against the "fast design" of the current industrial paradigm, which is governed by unsustainable cycles of fashion and over-consumption, business ethics, and anthropology that defines everyone as customers. (Fuad-Luke, 2008, p. 361)

The six principles have been developed around the terms reveal, expand, reflect, engage, participate and evolve and have resonance with ecocentric views of sustainability and whole systems thinking that is promoted by environmental activists such as Arne Naess.

Many design practitioners and theorists have contributed to the development of deep understandings of the role design and designers can play in creating more sustainable futures and through their work have opened up useful concepts and insights that can be drawn on in education. Manzini (2004), for example, has pioneered understandings in everyday, social practices and scenarios and the concept of enduring design. Chapman (date) has built on this to open up the area of emotional durability, how we design to maintain relationships with the products we own – a theme that has also been well developed in the context of sustainable fashion, for example by Fletcher (2008), Fletcher & Tham, (2014). Walker (2008) takes a critical approach, highlighting the potential of creative activity to challenge current notions of function in design and re-conceptualise these by setting up "an alternative to the novelty-based, vogueish approaches to design that ... spur consumerism" (Walker, 2008, p.7).

Critiquing what he describes as the 'sacrificial value' and seeming threat to the freedom of the designer that designing to address sustainability issues presents, Tonkinwise (2011) proposes an approach in which designers take a stance that shifts the reasons for action from negative to positive. In an intriguing re-positioning

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of needs and wants – in which wants become the desirable position, he suggests focusing not on why we *need* to change the way we are living, but why we *want* to.

Imagine declaring – I would like to live a life without fossil fuels; not because these cosmically rare sources of stable energy intensity are depleting, not because accessing energy from fossil fuels changes climatic systems of the earth, not because mass species extinctions are likely to result, nor even because mass displacements of the world's poor are already happening; but rather ... because I find pieces of coal dirty; because I don't like the people and profit from the oil industry; or because it would be fun to see how else society might be structured. (Tonkinwise, 2011, p.74)

Sustainable approaches within design practice are also opening up new methodologies such as co-design (Fuad-Luke, 2009) and metadesign (Wood, 2010; Tham & Jones, 2008). Both of these approaches recognise the value and importance of more democratic and collaborative approaches to designing, in which designers bring their expertise to interdisciplinary teams. This demonstrates an increasing shift away from the notion of the 'hero designers' to a recognition that creating sustainable futures is a team based, not a solo, activity.

In addition to designers pioneering approaches and understandings of a more ecocentric approach to design, higher education design educators are also providing insights. Rob Fleming (2013), writing in the context of architecture education, also highlights the importance of a co-creative approach. He highlights the danger of sustainable design in education being seen as a superficial veneer that is added to the constraints of a project, rather than a fundamental, ecological approach. In what he describes as the 'razor's edge' he contrasts 'green design that "expresses the societal goal of "wants" to "save the planet" and to "tread more lightly on the earth" – while at the same time consuming vast amounts of resources, inflicting significant damage to the planet through deforestation, desertification, erosion, pollution and climate change" with what he terms sustainable design – "a profound movement towards a neutral, if not regenerative relationship to the Earth and its resources, as in need to "do no harm," as the minimum condition" (Fleming, 2013, p. 59). The challenge in maintaining the latter position cannot be denied, but Fleming argues for an embedded approach that has core values of inclusion and cooperation at the centre of processes of designing. He argues that 'form follows worldview' and provides insights into how, through carefully structured design briefs and co-creative processes, a shift can be supported.

The design brief expresses the consciousness of the project, develops the necessary diverse stakeholders, determines the rules for the co-creative design process, sets the schedule of interactions and clearly illuminates the integrative goals of the project. (Fleming, 2013, p. 6)

The approach Fleming advocates places demands on teachers, but equally it places demands on learners, not least because there are expectations that they will develop, through their practice, a greater understanding and empathy for socio-cultural issues

and the skills of collaboration. In doing this he is addressing a ‘design problem’ seen by David Orr to be at the core of ecological design

The problem is not how to produce ecologically benign products for the consumer economy, but how to make decent communities in which people grow to be responsible citizens and whole people. (Orr, 2004, p.11)

ENVIRONMENT AND DESIGN AND TECHNOLOGY EDUCATION

In considering the above quote from David Orr in the context of D&T education, a transformative learning perspective might suggest that D&T education should focus first on developing young people as responsible citizens and second as design and technologists. Following such thinking through raises questions about how learning in D&T has been, is and could be prioritised. This chapter has raised a number of important issues that need to be explored in the context of Design and Technology education – and the chapters that follow in Sections two and three make excellent contributions to this endeavour. There are also important insights from existing literature that support the growth of understanding and practice. However, it is clear from the literature that research and practices in Design and Technology education is sparse. In a meta-analysis of critical discourse in research in Technology Education as represented in the *Journal of Technology Education*, Petrina (1998) noted that, across the first eight volumes of the journal, insubstantial focus had been placed on ecological issues, whereas substantial emphasis had been placed on economic drivers. He makes the point that “that a bit of critical discourse goes a long way in this Profession” (Petrina, 1998, p. 46) but the reality is that since 1998 this aspect of research has continued to be almost a ‘niche’ focus.

A Wholistic Approach

Some fourteen years further on, Pavlova (2013a) in a historical analysis of research into teaching and learning for sustainable development in Technology Education, also highlights the lack of research and practice in this area, seeing a major justification for Technology Education in schools continuing to be linked to economic competitiveness. While she notes a shift towards considering social, ethical and environmental impacts identified in research by Ritz (2009), she concludes that research into learning and teaching for ESD in Design and Technology is both fragmented and limited. The limitations frequently relate to there being a focus on environmental issues alone. Insights from earlier parts of this chapter suggest that an environmental lens is useful, but that a more wholistic, integrated approach is important. From Pavlova’s analysis it is evident that this is not just because of the space for transformative learning that is created by a more integrated view, but also in the potential for motivating D&T teachers towards ESD when a social dimension is included in project work, as was found by Pitt and Luben (2009).

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The value of an integrated view of sustainability is echoed by Elshof (2009) when making a case for environmental citizenship. He believes this to be of fundamental importance in creating a more rounded 'sustainable citizenship' that allows for learners to develop a broader, integrated critique and practice encouraging "mindfulness concerning our use of materials and be[ing] complemented by an understanding of how inequitable the gap that exists between the rich and the poor is, in terms of the global consumption of many materials" (Elshof, 2009 p.140).

World View

In earlier discussions of different viewpoints within ESD, a distinction was made between what has been identified as differing 'world views' as contrasted by an anthropocentric or an ecocentric stance. The former places a major emphasis on environmental stewardship first and foremost for the well-being of humans and this emphasis can be seen in many of the practices that prevail in D&T curricula and classrooms. Taking the English National Curriculum as an example, great emphasis had been placed through the five iterations of the curriculum that have guided practice over the last twenty five years on learners considering the needs of the people they are designing for. While much of this has been well intentioned and has allowed for relevance to be embedded into D&T projects, actively addressing more ecocentric projects is rare. Even when considering good classroom resources that introduce and support ideas of sustainability, the knowledge and understanding that is drawn on tends to more explicitly focus on looking after the environment for the sake of the human race. In exploring contrasting positions in the context of Technology Education, Pavlova draws on Huckle's critique. Huckle argues that "ecocentrism can be criticised in that it romanticises a nature outside society and fails to recognise that only humans can value things. Strong anthropocentrism/technocentrism can also be criticised in that it sanctions the exploitation and oppression of nature by treating it instrumentally or merely as a means to human ends" (Huckle, 2006, p.19). Pavlova (2009) sees value in both positions and suggests a balance between the two of "weak anthropocentrism" (Vardy & Grosch, 1999), drawing on Bonnett's (2002) concept of 'frame of mind', discussed earlier and Vernadsky's (1945) concept of *nöosphere* that aims at "harmonising the interrelationships between the environment and the world community" (Pavlova, 2009, p. 112).

The Product Paradigm Revisited

In an analysis of problem solving in Technology Education, Flowers (1998) takes an explicitly eco-centric stance in considering a Taoist perspective. Highlighting the increasing emphasis on product design and problem solving he notes a number of "definitions of technology center on 'control' over the 'human-made and natural environment' to better meet 'human needs and wants'" (Flowers, 1998, p.20). His view is that these perspectives lead to learning about materialism and draw on a

western approach. He counters this by drawing on Taoist philosophy and suggesting that learners should not concentrate on “whimsical or fanciful products” (p. 23) but should apply the risk-taking and independent thinking of problem solving to “what is best, not necessarily only what the clients want or think they want. They must practice the skills involved in deciding when the best path may not be a new technological product” (p.24). To most Design and Technology educators, the making of products is a central activity. To consider a course of action that doesn’t involve the creation of a new product is to challenge their ‘raison d’etre’. This issue was raised earlier in this chapter in relation to designers, where the ‘product paradigm’ was highlighted as being both central to practice and environmentally damaging. Elshof (2006) draws attention to the way this paradigm has dominated technological education, seeing “productivism as an encompassing belief system [that] offers an uncritical valorization of industry, economic growth, and the consumption of technological products and is a theme within many parts of technological education” (p.23). He suggests that four factors need to be challenged to enable teachers to move forward: that technologies only have instrumental purposes; that the production-consumption relationship is unrelated to ecological damage; that practices of repair, reduce, reuse and remanufacture should not be marginalised; and that there should be recognition that products not only expand human possibilities, they also restrict them. Drawing on Layton’s (1993) “critic competence” and Petrina’s (1998) “‘interdiscipline’ of technological criticism”, he proposes that the product paradigm can be reconceptualised through enabling learners to become critical “connoisseurs’ of products that ecologically responsible.

Embedding (Environmental?) Sustainability into the D&T Curriculum

Elshof recognises that shifting the paradigm is a challenge for teachers and it involves confronting worldviews and value systems that prevent approaches that are “tinkering at the edges” (Elshof 2009, p.135). Rose (2010) through the Enviro-tech Project also found teachers more likely to focus on sustainability issues that impacted on economy than on environment but highlighted a shift through the inclusion in the Standards for Technological Literacy (ITEA, 2000) of two statements that bring environmental concerns into the Technology Education curriculum by highlighting the need to understand the effects of technology on the environment and the ability to assess impact. However, she voices concern over the lack of preparation teachers have received to help them develop understandings that go beyond a narrowness of view. Despite some focus on the Standards, Elshof’s analysis of the Tech Tally report (Garmire & Pearson, 2006) indicated a failure “to mention any specific knowledge, critical thinking capacities for capabilities with respect to environmental and sustainability dimensions of technological thinking, design and capability that ‘technologically literate’ young people will need in the upcoming decades” (Elshof, 2009, p.135) and makes the case that the survival and thriving of Technology Education required ESD to integral in order to maintain relevance within the subject.

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Like Rose, he points to the need for teachers to be supported through initial and continuing professional development to avoid a “benign neglect” of developing young people’s criticality in relation to ecological issues. He makes the case that transformative education is needed for the teachers as well as the learners to enable a critical approach to be embedded in practices. - need for teacher professional development to be transformatory in order for this to be embedded in the experiences, understandings etc they bring into their own practices as teachers (Elshof, 2005).

A more recent Delphi study by Rossouw et al (2010) presents a level of optimism. The study, drawing on the responses of thirty two international experts from the fields of philosophy/history of technology, engineering education and technology education to a list of transferable concepts and contexts that could be taught in engineering and technology education, created a set of priorities of key concepts that ranked sustainability as ninth out of thirty four and, for contexts, ranked energy in society, biotechnology and sustainable technology as first, second and third out of thirty five contexts. Whilst the views of a group of international experts may differ from practices on the ground, it is still encouraging to see the level of agreement and priority presented.

This chapter has opened up the territory and issues that particularly relate to environment in the context of the possibilities and challenges for Design and Technology Education if it is to make a critical impact on young people’s ability to contribute to sustainable futures in their communities, in society and at a global level. By necessity the chapter has provided a broad scoping. Fortunately greater depth and grounding is provided through the chapters that follow in sections two and three. I trust that collectively the important role of the environment is communicated at a level that allows for its increasing and sustainable inclusion in the learning activities provided in design and technology classrooms.

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