Working with/in/against More-Than-Human Environmental Sustainability Education

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Concerns about the state of the environment, accompanied by calls for government action and education responses, have been around for decades. These concerns have focused on a variety of issues, most recently through the media alerting us to the need to respond to climate change, species extinction, and waste (particularly plastics) management issues. At an international level these concerns have predominantly been about the human environment, but more recently there have been calls for a new focus that takes into account the more-than-human, thus posing theoretical challenges to the dominant philosophy of environmental education which is very anthropocentric. Increasingly, as I discuss in this article, humans are looking to the natural environment "to supplement and augment human cognition and biology" (Danaher, 2015) and both dissolving the tree of life and creating transhumans/posthumans/ more-than-humans. These developments are of particular importance in environmental education which has frequently been dominated by a (hu)man/nature binary agenda, and yet now must "stay with the trouble" (Haraway, 2016).

International concern about the state of the environment first reached the global agenda in 1972 when the *United Nations* convened a *Conference on the Human Environment* in Stockholm. The *Declaration* from this conference provides a vision and set of common principles focused on actions for preserving and enhancing the human environment. For example, the second paragraph of the *Declaration* highlights the importance of protecting and improving the human environment:

"The protection and improvement of the human environment is a major issue which affects the well-being of peoples and economic development throughout the world. It is the urgent desire of the peoples of the whole world and the duty of all governments" (United Nations, 1972, n.p.).

The *United Nations* convened conferences around environment and development in 1992 in Rio de Janeiro (United Nations, 1993), in 2002 in Johannesburg (United Nations, 2002) and then again in Rio in 2012. The *Common Vision* from this last conference, *The Future We Want* (United Nations, 2012), is grounded in a different orientation, opening with a commitment to ensuring "the promotion of an economically, socially and environmentally sustainable future for our planet and for present and future generations" (Paragraph 1, p. 1), and promulgating sustainable development as, "integrating economic, social and environmental aspects and recognizing their interlinkages, so as to achieve sustainable development in all its dimensions" (Paragraph 3, p. 2). The second paragraph states, "Eradicating poverty is the greatest global challenge facing the world today and an indispensible requirement for sustainable development" (p. 1), which is a very different focus from the Stockholm Declaration's concern for the protection and improvement of the human environment. More recently, a *UNESCO Global Action Programme on Education for Sustainable Development* policy brief (Didham, 2018) has discussed unpacking Sustainable Development Target 4.7, that by 2030 all countries should

> "ensure that all learners are provided with the knowledge and skills to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development" (United Nations 2016, n.p.).

Didham (2018, p. 1) states that "ESD helps individuals to better understand the environmental and social impacts of their daily lifestyle choices, and it can support cooperative learning and critical examination which leads to collective reimaging of lifestyle practices and identification of sustainable solutions", continuing the human focus and ignoring environmental protection.

After the inception of the *UNESCO International Environmental Education Programme* and its activities such as the Belgrade Workshop (UNESCO, 1975) and the Tbilisi Conference (UNESCO, 1978), environmental education increasingly emphasized consideration of the environment in its totality (natural, cultural, technological and social), not just the human environment.

At the same time as environmental education was becoming established, Arne Naess (1973) and others in the deep ecology movement of ecophilosophy were voicing their concerns about the human-centeredness of the environment movement and proposing a set of ecocentric principles to replace the anthropocentric view implicit in the United Nations' declaration, and that the document's utilitarian view of nature be replaced with one of nature's inherent value. Deep ecology as a philosophy was challenged from many directions [1. A 2014 special

issue of The Trumpeter: Journal of Ecosophy (volume 30, number 2) specifically focused on Whatever Happened to Deep Ecology?], particularly ecofeminists [2. See, for example, a 1991 special issue of Hypatia: A Journal of Feminist Philosophy (volume 6, number 1) on Ecological Feminism.], with a major criticism being that Naess retained and replicated a modernist notion of an objective "Nature" apart from and transcendent of the socio-political realm of humans (Kowalsky, 2014). However, there are connections between the position of deep ecologists and present day advocates of the *Anthropocene*, postenvironmentalisms and new materialism, which are not necessarily being acknowledged.

Similarly, as I have discussed elsewhere (Gough and Whitehouse, 2018), new materialism advocates are not necessarily recognising the contributions of ecofeminism. Rather, there is an overlooking of ecofeminism, which was marginalized by accusations of essentialism (Gaard, 2011; Phillips & Rumens, 2016) in the 1990s, but is now resurgent based around feminist philosophical contributions such as partnership ethics (Merchant, 1992, 2003, 2016), and natureculture (Haraway, 2003, 2016). As Richard Twine (2010, p. 402) suggested, "the emergence of a feminist new materialism ought to usher in a renewed conversation between feminism and ecofeminism due to shared interests".

Both new materialism and ecofeminism reject human/nature binaries, with Stacy Alaimo and Susan Heckman (2008), for example, arguing for the agency of nature and for a material feminism that reconceptualizes nature in ways that account for "'intra-actions' (in Karen Barad's terms) between phenomena that are material, discursive, human, more-than-human, corporeal, and technological" (p. 5). What actually constitutes "human" has become more problematic in recent years.

Stefan Helmreich (2009) discusses dissolving the tree of life because what counts as biological life is changing, as is the relation between "life forms" and "forms of life", and what counts as native or alien, familial or other. His arguments are based around recent research in the deep ocean which has shown that microbes are mosaic of acquired genes through lateral gene transfers, shuffling "genes back and forth with their contemporaries, an activity mixing up their own and others' genealogies" making it "extremely difficult to arrive at a root for the tree of life" (p. 82), and suggests a "rhizomatic, reticulated representation as an alternative to the linearity of the tree diagram" (p. 83). This has biological resonances with the work of Deleuze and Guattari (1987) on rhizomes and assemblages. More recently, Ivancevic et al. (2018) have identified mobile DNA sequences, colloquially known as jumping genes because of their ability to replicate to new genomic locations. They conclude that "Given that these transposable elements have colonised more than half of the genome sequence in today's mammals, our results support a role for horizontal transfer in causing long-term genomic change in new host organisms" (p. 1).

Helmreich (2009) is not alone in recognising that what counts as biological life is changing and that human and more-than-human life is very much entangled. For example, although she does not mention oceans, Carolyn Merchant (2016) discusses new concepts of nature based on the idea of autonomous nature: "Autonomous nature is the nature at the root of the new chaos and complexity paradigm in which humans and nonhuman nature must exist together and thrive" (p. 161), and concludes that

> "Nature becomes postnature in ways that so thoroughly blur any human/nature differences as to make a single interactive, mutually influential, and mutually interdependent post-human-nature… a new relationship between humanity and nature based on the idea of autonomous nature" (p. 161).

Merchant uses the terms 'nonhuman' and 'posthuman', however Probyn (2016) argues that, while these terms and 'more-than-human' "are generative in that they seek to shake up any assumptions that we might have had about what conjoins and what separates us, not to mention what that profoundly confusing 'us' might be", she prefers 'more-than-human' because it is "ontologically and materially relational, and opens up new epistemologies as it narrows the diverse and shifting relations between and among humans, and the many different aspects of that are so much more-than-human" (p. 110). I find her argument useful.

Other scholars have attempted to redefine nature in relationship to human culture and human society. These include Bruno Latour's (1993) concept of natures-cultures as an interactive human/nature system: "The very notion of culture is an artifact created by bracketing Nature off. Cultures – different or universal – do not exist any more than Nature does. There are only natures-cultures, and these offer the only possible basis for comparison." (p. 104) Kate Soper (1995), from the perspective of discourses about nature and concerns about the meaning of 'nature' and 'non-human', questions whether there is such a thing as non-human nature and argues that nature as 'other' encompasses everything that is not human while recognizing that we also see ourselves being within a wider understanding of nature "'Nature' in this is both that which we are not *and* that which we are within" (p. 21, emphasis in original).

These changing conceptions of nature all draw attention to the entanglement of human and more-than-human life, which has implications for how we teach about forms of life and life forms in science education which I discuss in later sections. They are also relevant to discussions about new materialism. For example, Karen Barad (2007) argues:

> "Bodies do not simply take their places in the world. They are not simply situated in, or located in, particular environments. Rather 'environments' and 'bodies' are intra-actively co-constituted. Bodies ('human', 'environmental,' or otherwise) are integral 'parts' of, or dynamic reconfigurings of, what is" (p. 170).

This entanglement of the world and everything in it leads Barad to argue that there are no separate "objects" with boundaries in nature, but there are identifiable "phenomena", which are the "ontological inseparability of agentially intra-acting components" and "basic units of reality", where "'intra-action' *signifies the mutual constitution of entangled agencies*" (p. 33, emphasis in original). Similarly, for Sonu and Nathan Snaza (2015, p. 259) new materialism is

> "a subset of the posthumanist drift in the fields of philosophy, biology, and the human sciences – attempts to rethink human subjectivity so that it accounts for its relationship with non-human affect and force".

For Jean-Luc Nancy (2007) this is an example of mondialisation, where the world has become a glome or glomus: "A world is precisely that in which there is room for everyone, but a genuine place, one in which things can genuinely take place (in this world). Otherwise, this is not a "world": it is a "globe" or a "glome", it is a "land of exile" and a "vale of tears". (p. 42). He continues,

> "In such a glomus, we see the conjunction of an indefinite growth of techno-science, or a correlative exponential growth of populations, of a worsening of inequalities of all sorts within these populations – economic, biological, and cultural – and of a dissipation of the certainties, images, and identities of what the world was with its parts and humanity with its characteristics" (p. 34).

These notions of techno-science take us into the realms of biopolitics and entanglements. Helmreich extends biopolitics in symbiopolitics: "the governance of relations among entangled living things" (p. 15). His notion of symbiopolitics involves the organisms that live in symbiosis with bacteria, as what Haraway (2008) has called companion species, as well as stranger species, in an association that "recognizes novel kinds of networked agents, human and nonhuman in the drama of the sciences" (p. 24). These stranger species include extremophiles, such as deep sea vent microbes that thrive at extremely high temperatures which are now being brought to the market as enzymes to make biochemical reactions run hotter and faster: "These microbes are hyperlinked not just to other organisms through gene transfer but also to new kinds of biotechnological science, capital, politics" (Helmreich, 2009, p. 100). Thus, "human biocultural practices flow into the putatively natural zone of the ocean, scrambling nature and culture, life forms and forms of life" (Helmreich, 2009, p. 13).

A more-than-human curriculum would need to take into account the dissolving of the evolutionary tree that relates to all organisms because, as previously discussed, the sequencing of complete genomes of bacteria, eukarya and archaea have shown that microbes are mosaic of acquired genes, and that lateral gene transfer is occurring blurs boundaries. This goes a long way beyond what is in the current curriculum.

A more-than-human curriculum would need to stop simplifying the environment and accept that environments constitute complex entanglements. It would also need to include "pedagogies inspired by posthumanist and new materialist ontologies [that] are situational encounters made up of entanglements and interweavings, conjoint actions and political ecologies, entanglements that are alive, vibrant, and powerful" (Sonu and Snaza, 2015, p. 274). Probyn (2016, p. 16) provides a clear example of entanglements and interweavings, which relates to the Australian Year 2 Humanities and Social Sciences curriculum content elaboration (studying patterns and relationships between marine animals and where human rubbish may go) (ACARA, 2018), when she writes: "Fish eat the microplastics used in daily skin care; humans eat the fish and the microplastics; and fish and human bodies intermingle." Studying the environment and our entanglements with it means examining the more-than-human assemblages of fish, institutional power, gender and class relations, and technology. This is very different from a simple study of the environmental and social impacts of individual and group daily lifestyle choices (Didham, 2018) – it is an entanglement of the economic, environmental, social and cultural with the political and biological, if not more.

One existing framework that warrants consideration in this context is Merchant's (2016) partnership ethic. This contains five precepts for a human community in a sustainable partnership with what she calls a nonhuman community – which is in a particular place, a place in which connections to the larger world are recognized through economic and ecological exchanges:

> Equity between the human and nonhuman communities.
>
> Moral consideration for both humans and other species.
>
> Respect for both cultural diversity and biodiversity.
>
> Inclusion of women, minorities, and nonhuman nature in the code of ethical accountability.

> An ecologically sound management that is consistent with the continued health of both the human and the nonhuman communities.

To these we need to add overt recognition of the more-than-human assemblages discussed by Probyn (2016) and Helmreich (2009): "The more-than-human, if it is to be meaningful as a perspective, makes us confront again and again the relatedness of all entities" (Probyn, 2016, p. 163). However, Merchant's precepts are a start for a curriculum that, instead of seeking simplicity and certainty, recognizes that we live in a complex world of assemblages that we can never fully know. Working with/in/against the more-than-human is an ongoing curriculum and philosophical challenge, but a necessary one for a better understanding of the human condition and our entanglements with environments.

The challenge, as Haraway noted, is learning how humans and other species may live and die well together on a damaged planet (Haraway 2016). However, our educational discourses and practices around environmental sustainability are currently "human, all too human" (Nietzsche, 1878) focused and do not take into account the transhumans/posthumans/more-than-humans that are being created in our athwart practices. We need to be working with/in/against these changes in order to generate meaningful learning practices.

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About the Author

Annette Gough is Professor Emerita in science and environmental education at RMIT University, Melbourne, Australia. Her research interests span environmental, sustainability and science education, research methodologies, posthuman and gender studies and she has completed research projects for national and state governments as well as working with UNESCO, UNEP and UNESCO-UNEVOC on several research and development projects. Most recently she has been teaching postgraduate educational research methodology courses, but previously she has taught internationalising the curriculum, educational research methodologies, curriculum inquiry, and environmental and science education courses.

However, environmental sustainability advocates can work in terms of economic development by contributing to the design plans. They can show the engineers parts that can be improved in order to preserve as much of the endangered areas as possible. Conversely, by allocating more funds to preservation projects, environmental sustainability could be increased both in protected land and through educating the public on environmental issues. Overall, both sides should come together and balance their levels of implication. This means that new legislation should be established to regulate the impact o Humans â€“ and human societies â€“ are complex, with different dynamics, feedbacks, and structures in place that are not easy to change. While science helps unpack these complexities, many of the useful insights on how to actually transform behaviour remain hidden inside scientific journals and laboratories, with integration in practice only just beginning2 2. Reddy, S. M. W., Montambault, J., Masuda, Y. J., Keenan, E., Butler, W., Fisher, J. R. B.Â But there are still countless insights and tactics applied in other sectors that are yet to be explored for sustainable development. Working with/in/against more-than-human environmental sustainability education. On Education: Journal for Research and Debate, 1, 1â€“5. (Accessed August 16 2019.) Greenwood, D. (2013). A critical theory of place-conscious education. In R. Stevenson, M. Brady, J. Dillon, & A. Wals (Eds.), International handbook of research on environmental education (pp. 93â€“100). Abingdon: Routledge. Google Scholar.Â More than national education: Possibilities for critical participatory learning in the Australian curriculum through civics and citizenship. Curriculum Perspectives, 37(1), 51â€“61. Article Google Scholar. Environmental Education is a multidisciplinary field that integrates subjects such as Biology, Ecology, Geography, Earth Science, Physics, ChemistryÂ The Human impact on the earthâ€™s ecosystem has led to the constant degradation of the environment which has resulted in a global climatic change. The UNESCO (United Nations Educational, Scientific and Cultural Organization) states that in order to safeguard the future Global developments of societal Quality of life, a widespread environmental awareness has to be enhanced.Â Environmental Education has been in existence since quite some time although its importance has been emphasized in the later years with the growing global climatic changes. Making businesses more sustainable starts with being aware of the issue at hand and understanding just how important it is to make changes â€” both for the business and the planet. The intent of this resource is to help business owners, administrators, and leaders make their organizations more environmentally aware.Â An environmentally aware business considers more than just profits â€” it considers its impact on society and the environment. Such a business is sustainable because it contributes to the health of the structure within which it operates, thereby helping construct an environment in which the business can thrive.