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FORUM

How could it be? calling for science curricula that cultivate morals and values towards other animals and nature

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Abstract Can science curricula truly cultivate morals and values towards nature? This is the question that is raised by Carolina Castano Rodriguez in her critique of the new Australian Science curriculum. In this response to Castano Rodriguez's paper we ask two questions relating to: the influence of curricula on the relationships of children and other animals; and other models of science education regarding animals and nature that may be more relevant, just, or caring. In responding to these questions stimulated by the reading of Castano Rodriguez's paper, we reflect on our own experiences. We note the conflict between the values depicted in the curriculum priorities and the underlying anthropocentric view that appears to be embedded in the Australian Science Curriculum and in curricula generally. With this conflict in mind we encourage educators to examine our own practices regarding how the relationships between humans and other animals are promoted. We put forward the idea of science education that responds to the shifting views of science and its applications outside the confines of the laboratory to one that encourages both ethical and political discussion that is already taking place in the community relating to the role of science and technology in our lives and the lives of other animals.

Keywords Values · Animals · Nature · National curriculum · Science technology · Society

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This review essay addresses issues raised in Carolina Castano Rodriguez's paper entitled: Which values regarding nature and other species are we promoting in the Australian Science Curriculum? DOI:10.1007/s11422-015-9675-7.

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The mere suggestion that a national science curriculum can or should "cultivate values of care for nature" among a citizenry's next generation might be seen by some as overly optimistic at best and irrational at worst. Yet that very claim is the central focus in Carolina Castano Rodriguez's critique of the new Australian Science Curriculum, and for good reason. Educators from a range of critical perspectives have long noted that human relationships with non-human animals in many parts of the world are exploitative, oppressive, and even lethal (Pedersen 2010). Castano Rodriguez's focused analysis suggests that Australia's new national science education standards provide a particular focal point for critical analysis. The author claims that uncovering the explicit and implicit values present within the new curriculum provides insight into the moral framework about human-animal-nature relationships that Australian children will learn and incorporate into their attitudes and behaviors.

In this Forum, we wish to respond to this work with two questions and a few brief reflections that emerged in our close readings of Castano Rodriguez's work. Our reflections on these lead to further matters of uncertainty, and we hope these concerns will inspire further work beyond the scope of this response.

Question 1

The power and promise of large-scale educational policies and documents raises question about their impact on material lives. To that end, we wonder to what extent the standardized, national curriculum presented in this article actually factors into Australian children's moral development regarding nature and animals. How does the curriculum influence the relationships of children and other animals themselves?

Marianne

Most scientists recognize that we have entered the Anthropocene epoch where the activities of humans have significantly impacted our world's ecosystems (Steffen, Crutzen and McNeill 2007). Regardless of this recognition of the damage of human activity on the environment and calls by countless environmental educators to protect the environment, this anthropocentric belief where the Earth is seen as a resource to be consumed is prevalent. Derek Hodson (2003) argued that science, as a value-laden endeavor, has the potential to promote a particular set of ethics and morals surrounding human impact on the environment. Castano Rodriguez (2015) boldly attempted to highlight the conflict between the aims and values of the new Australian Science Curriculum and its ability to actually promote true values of care for the natural environment and other species in its content and elaborations. This thought-provoking article argued how a science curriculum should educate students to become aware of our close relationship to other animals and our interdependence on other living things including values and aspects of morality. The Australian Curriculum advocates sustainability as a cross curricula priority stating that it is:

> [F]utures-oriented, focusing on protecting environments and creating a more ecologically and socially just world through informed action. Actions that support more sustainable patterns of living require consideration of environmental, social, cultural and economic systems and their interdependence, (Australian Curriculum Assessment and Reporting Authority (ACARA), 2015a)

The cross curriculum priorities and general capabilities in the Australian Curriculum also promote *ethical behavior*, *intercultural understanding*, and *Aboriginal and Torres Straight Islanders histories and cultures*. However on close examination of the content and elaborations Castano Rodriguez discovered that within the curriculum—despite the values identified and the call for students to take informed action—there are underlying or hidden values that promote an Anthropocentric view. This view positions animals as separate from humans and portrays nature as a resource for the benefit of humans. The Australian curriculum misses a valuable opportunity to highlight the social and emotional capacities of other animals and to encourage more critical analysis of human actions towards other animals or nature.

Joshua

As the author points out, there are both explicit and implicit ways in which values and ethics are encoded within the Australian science curriculum materials. Castano Rodriguez draws our attention in particular to the anthropocentric frameworks that emerge time and time again within her analyses. This human-centered focus in and of itself is not surprising, but given the curriculum's claim to present multicultural views (including aboriginal views) as well as varied discussions of ethical behavior, there seems to be only a superficial, descriptive approach. Clearly, despite a growing need for science education to both present and respond to various environmental and social dilemmas, Castano Rodriguez's work emphasizes that the Australian national curriculum is written to avoid the kinds of deep ethical reflection that may emerge in the less formal or standardized approaches in some environmental education programs (Wals, Brody, Dillon, and Stevenson 2014). There is often debate about the gaps between science education and environmental education, with some scholars suggesting that perhaps only the latter is truly "value oriented." As Hodson (2003) and others note, we might put aside that debate at this point and focus more on the many literacies—media, technology, social, moral, scientific, and ecological—that draw lines of both convergence and divergence between science and environmental education.

I am also reminded of John Dewey's (1916) description of curricula as existing both inside and outside of the classroom, and of children as living and learning within overlapping curricular spaces. On the one hand, the existence of multiple curricular locations and educational experiences suggests that a national curriculum is not the only source of knowledge and value for children. On the other hand, that does not preclude critical analysis of curricular materials that aim to be comprehensive in their presentation of a discipline. School-based education, within a democratic context, has civic and ethical implications. As Hodson suggests:

> [T]he very purpose of the science component of education for citizenship… is to enable young citizens to look critically at the society we have, and the values that sustain it, and to ask what can and should be changed in order to achieve a more socially just democracy and to ensure more environmentally sustainable lifestyles. (2003 p. 654)

Avoiding critical reflections in the classroom in terms of curricular requirements does not diminish or erase the possibility that deeper conversations about citizenship and science will occur, but it does remove the opportunity to structure dialogue between students and teachers in a more comprehensive and contextually meaningful way.

Question 2

Alternatives might be offered or suggested here. Are there models of science education regarding animals and nature that may be more relevant, just, or caring within an Australian context? How and where might educators challenge standardized national approaches and visions—in Australia and elsewhere—with curricula that provide more comprehensive, historical, and critical opportunities for thinking about and with animals?

Marianne

Within the anthropocentric view, humans are perceived as separate from the environment and I am concerned that current curricula, particularly in Western countries, do little to counteract this way of thinking (Kuzich 2011). Unless the curriculum moves away from this anthropocentric view and specifically emphasizes the connection of humans with other animals are teachers going to make that connection in the classroom? Castano Rodriguez highlights how the Australian Curriculum for Year 4 science understanding states that "living things have lifecycles" and an elaboration of this knowledge includes: "to describe the life cycle of living things such as insects, birds, frogs and flowering plants" (ACARA 2015b p. 28) and humans are not included alongside other animals.

The following vignette illustrates how simple changes in the curriculum could enhance the human connection to other living organisms. Pre-service teachers were carrying out science lessons in the primary classroom in an Australian setting as part of their Bachelor of Education science curriculum studies. In contrast to the elaboration in the Australian Curriculum, the teachers were encouraged to include humans when comparing life cycles of living organisms. The children caught on to this very quickly without any prompting and constructed diagrams of three lifecycles: a human, a chicken, and a bean plant. The children had recently observed chickens hatching from eggs and these chickens were at what the children described—the teenage stage (or in the case of a plant—a young bean plant). When the baby chicks were newly hatched the children said they were like new born human babies or emerging bean shoots from the seeds and they compared their adult chickens with a mature fully reproductive bean plant and a pregnant human.

I challenge educators to reflect on their own practices and avoid promoting anthropocentric values where humans are considered outside the animal kingdom and separate from the natural environment as we may not even be conscious that we are carrying out such practices. What is stopping science education building on this link of humans with other living organisms and the emphasis of aspects such as the similarities of the complex social and emotional features as well as the biological features of animals (both humans and other animals)? Drawing on her previous work (Castano 2012) Castano Rodriguez asks the question: would an awareness of the characteristics that humans and other animals share such as intelligence, pain, grief, or loss and the thorough analysis and debating of implications surrounding human control and treatment of other animals and nature lead to generating values of care and compassion?

Joshua

Science is as an area of human endeavor that has both increased our knowledge and concern about non-human animals (Waldau 2013) and simultaneously provides various contexts and justifications wherein the non-human animals and other beings that make up

our world have been historically subjugated and oppressed (Birke 1995). In response to such framing, contemporary approaches to science education might provide a vital opportunity for carefully and critically thinking through the varied history of the Enlightenment's influence on knowledge making and discovery. The past two hundred years of scientific advancements and study have resulted in highly ordered and technologically mediated lives for many. Yet, science from the Enlightenment to today has also heavily structured humans' current relationships with non-human animals. This is especially true within so-called "Western" contexts. Edgar Jenkins argues that despite critiques of science in contemporary scholarship, "science education continues to portray science in what might be called its heroic Enlightenment mode" (2002 p. 21). Others suggest that science has been increasingly vilified for its role in various catastrophes or unchecked techno-scientific advances (Hodson 2003). Such statements might also ring true when considering the history of science and its use of non-human animals as well (Haraway 1991). In a sense, science education needs to respond to the shifting views of science and its applications outside of the confines of the laboratory. My own research involves interviews with children about their relationships with non-human animals as well as participant observations at museums and zoos. Within informal science learning environments in particular, I have seen and overheard many children discuss information presented on natural selection, technological progress, and scientific discovery. Their comments to peers, teachers, and parents suggest to me that children and families are already engaged in discussions about the benefits, limitations, and "murky" areas of scientific and technological progress in our own societies and in the lives of others (including non-human animals). It would seem crucial that science educators enter into such conversations in formal and informal settings, in order to provide structure, time, and space for clarity and dialogue.

Castano Rodriguez's article provides a critical opportunity for reflection in urging us to question the extent to which school science curricula address various social and ethical concerns. How do we move away from a tentative vision of education that seeks to present material or disciplines as benign? Can we create curricular spaces wherein reflection about scientific endeavor, progress, and methodologies are critically considered from a variety of ethical points of view? To what extent can science education be employed in the classroom as a way of examining and potentially critiquing some of the long-standing positions that the discipline and its practitioners have espoused in the name of knowledge and progress?

Conclusion

Castano Rodriguez's article has inspired us to think more deeply about the role of national curricula in promoting various ethical and political views about non-human animals and the natural world. To be sure, we hypothesize that many large-scale science curricula take up similar points of view. National science curriculum developers may refuse to directly engage with the heterogeneity of worldviews and moral considerations that exist within multicultural societies for a variety of reasons, some of which may be intentional or unintentional. As scholars, it is our responsibility to ask questions about the silences and gaps that exist within these powerful texts. In addition, we suggest that there are many disadvantages for children and non-human animals when science education ignores the complex connections between science, technology, society, and environment (Kumar and Chubin 2000). On the one hand, we recognize that further analysis of similar curricula needs to be undertaken. On the other

hand, we encourage scholars and educators to take on the more practical and difficult task of engaging with curriculum developers and politicians in order to promote a wider vision of science literacy; one that includes the difficult ethical and political discussions that many children, families, and communities are already having about the role of science and technology in our own lives and in the lives of more-than-human beings.

References

Australian Curriculum Assessment and Reporting Authority (ACARA), (2015). Cross curriculum priorities. Sydney: ACARA. Retrieved October 20, 2015 from http://www.australiancurriculum.edu.au/crosscurriculumpriorities/sustainability/overview.

Australian Curriculum Assessment and Reporting Authority (ACARA), (2015b). The Australian curriculum science (Foundation to 10) (Version 8). Sydney: ACARA. Retrieved October 20, 2015 from http://www.australiancurriculum.edu.au/download/f10.

Birke, L. (1995). Exploring the boundaries: Feminism, animals, and science. In C. J. Adams & J. Donovan (Eds.), *Animals and women feminist theoretical explorations.* Durham and London: Duke University Press.

Castano, C. (2012). Fostering compassionate attitudes and the amelioration of aggression through a science class. *Journal of Research in Science Teaching, 49*, 961–986. doi:10.1002/tea.21023.

Castano Rodriguez, C. (2015). Which values regarding nature and other species are we promoting in the Australian Science Curriculum? *Cultural Studies of Science Education*. doi:10.1007/s11422-015-9675-7.

Dewey, J. (1916). *Democracy and education: An introduction to the philosophy of education*. New York: MacMillan.

Haraway, D. (1991). *Simians, cyborgs, and women: The reinvention of nature*. London: Routledge.

Hodson, D. (2003). Time for action. Science education for an alternative future. *International Journal of Science Education, 25*(6), 645–670. doi:10.1080/09500690305021.

Jenkins, E. (2002). Linking school science education with action. *Counterpoints, 210*, 17–34.

Kumar, D., & Chubin, D. (2000). Introduction. In D. D. Kumar & D. E. Chubin (Eds.), *Science, technology, and society: A sourcebook on research and practice* (pp. 2–8). New York: Kluwer Academic/Plenum Publishers.

Kuzich, S. (2011). It's not only green that matters: Understanding education for sustainability in schools. *International Journal of Environmental, Cultural, Economic and Social Sustainability, 7*(3), 27–36.

Pedersen, H. (2010). Is 'the posthuman'educable? on the convergence of educational philosophy, animal studies, and posthumanist theory. *Discourse: Studies in the Cultural Politics of Education, 31*(2), 237–250. doi:10.1080/01596301003679750.

Steffen, W., Crutzen, P., & McNeill, J. (2007). The Anthropocene: Are humans now overwhelming the great forces of nature. *AMBIO: A Journal of the Human Environment, 36*(8), 614–621. doi:10.1579/0044-7447(2007)36[614:TAAHNO]2.0.CO;2.

Waldau, P. (2013). *Animal studies: An introduction*. Cambridge: Oxford University Press.

Wals, A. E., Brody, M., Dillon, J., & Stevenson, R. B. (2014). Convergence between science and environmental education. *Science, 344*(6184), 583–584. doi:10.1126/science.1250515.

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