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Résumé de l'article

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Integrating Advocacy and Environmental Education: A Response to Burns & Norris

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This paper responds to David Burns and Stephen Norris whose article, “Open-minded Environmental Education in the Science Classroom”, appeared in Volume 18(1) of Paideusis. Burns and Norris (2009) suggest an incompatibility between environmental advocacy and science education because they feel that environmental advocacy necessarily promotes particular political agendas that are extra-scientific, and that such agendas subvert the development of open-mindedness (Hare, 1979; 2000; 2003). In this paper, I offer an alternative reading of Hare’s concept of open-mindedness that is more accepting of careful and thoughtful integrations of science education and social advocacy. I offer an epistemological justification that suggests that advocacy in education (in science and elsewhere) is not only compatible with the concept of open-mindedness, but may also serve as a vehicle for its flourishing.

The article “Open-minded Environmental Education in the Science Classroom” (Burns & Norris, 2009), published in a recent issue of this journal, is an important and timely contribution to both environmental education and science education philosophy. Burns and Norris (2009) suggest an incompatibility between environmental advocacy and science education. They feel that environmental advocacy necessarily promotes particular political agendas that are extra-scientific and therefore subvert the development of open-mindedness (Hare, 1979, 2000, 2003). The authors focus on environmental education and argue in favour of “non-value-endorsing” approaches; that is, environmental education curricula that do not promote environmental values. In the current paper, I open a conversation with Burns and Norris (2009) and ask them to consider a reformulation of their position with a view to cautioning science educators about the challenges of taking on contentious issues in the classroom, but that does not absolutely condemn pedagogies that offer students curricular opportunities to engage with environmental advocacy. I approach this conversation under the presupposition that student-directed, teacher-facilitated environmental advocacy may have rich learning outcomes in science disciplines and beyond.

Integrating Advocacy and Education

Education and advocacy can be a dubious pairing and Burns and Norris (2009) are right to assume a cautious stance where the two intersect. The authors’ concern “that it is not appropriate to expect science educators to advance contentious agendas” (p. 35) is merited, as much contemporary curriculum (both official and supplemental) advocates political agendas in ways that may betray aims of

education such as critical thinking and open-mindedness (Hare, 2000). The authors rightly note that science pedagogies should go beyond the delivery of objective findings and help students to engage with the meaning of these findings for societies. Such an understanding is a demonstration of Burns and Norris's (2009) recognition of the normative qualities of both science and of education. In this paper, I respond to Burns and Norris (2009) in a way that acknowledges their recognition that science-based environmental education is about more than just furnishing students with scientific facts, but also suggests that open-minded approaches to advocacy in environmental education may be possible. In my use of the term, advocacy means activities and ideas set within a particular context that are concerned with social or political values.

Critical to the discussion that will unfold in this paper is an understanding of exactly what is intended by the term advocacy. Advocacy can have a variety of meanings ranging from an innocuous suggestion of preference for a particular idea or course of action, to a much more politically loaded ideological campaign. These positions represent two ends of a spectrum of what advocacy can mean, but the position I take in this paper lies somewhere in between these poles. For me, advocacy is a politically focused series of actions, but it need not necessarily be understood as close-mindedly ideological. Like Burns and Norris (2009), the understanding of advocacy that I apply in this paper is primarily concerned with values and "contentious agendas" (p. 35). I am supportive of educational initiatives that invite students to participate in sociopolitical activities, either individually or collaboratively, but I do not presuppose that such engagements elevate the values explored through advocacy to the level of doctrinaire truth.

While trends towards doctrinaire environmental education curriculum are disconcerting, I am not certain that Burns and Norris's (2009) concerns about value-endorsing pedagogy warrant the conclusion that "educators and scholars should be concerned to keep apart such efforts and science education" (p. 35). While prohibition of advocacy within education may prevent teachers from taking advantage of their influence over students (unintentionally, or otherwise), I wonder what valuable science, environmental, and civics education opportunities may be lost if advocacy is ruled out as an educational process. Can there be no place for advocacy in science education, environmental education, or in education more generally? What are the possibilities for teachers, including environmental educators, to take up advocacy in their pedagogy in ways that allow students to think critically about contentious social issues and to wrestle with decisions about what it means to be a good citizen? Finally, what are the risks of a science education that does not engage with values or purports to be value-neutral?

While this short paper does not afford me the scope to address all of these questions, I suggest in response to Burns and Norris (2009) that environmental advocacy may be an appropriate way to open a discussion of values in science education contexts, while still fostering open-mindedness. I do this by offering an interpretation of Hare's (1979, 2000, 2003) concept of open-mindedness that may shed a more affirming light on the possibilities for advocacy in environmental education. These tasks will be more effective, however, with a clearer explanation of my objection to Burns and Norris's (2009) disavowal of advocacy within science education.

Relationships Among Values, Science, and Education

While reading Burns and Norris' (2009) article, two main objections arose for me. First, the dichotomous characterization of science education approaches as either value-endorsing or non-value endorsing is problematic. Such a conception greatly oversimplifies the normative quality of education, both conceptually and in day-to-day enactment (Barrow & Woods, 2006; Peters, 1966). If, as the authors suggest, teaching is not value free, some grey area between value-endorsing and non-value-endorsing may be desirable as it could provide science educators with space in which to discuss

contentious socio-scientific issues in ways that foreground complexity and a plurality of possible responses or solutions. Second, Burns and Norris (2009) call for open-minded environmental education within the science classroom without any discussion of the need to be open-minded about the value of scientific knowledge itself (Hodson, 2003), an issue that has been criticized for its Cartesian reductionism (Evernden, 1985; Jickling, 2009). If science educators are to bring to their practice an “open-mindedness about environmental concerns such that all proposals for sustainability and the like are weighted against the alternatives using the best scientific knowledge available” (p. 35), should not this lens of open-mindedness also be applied reflexively to the scientistic epistemological assumptions that inform inquiry in the science classroom? In this section I will briefly explicate each of these objections.

Burns and Norris (2009) differentiate between two approaches to environmental education; value-endorsing, which “promote particular environmental values” (p. 37), and non-value-endorsing approaches that do not endorse particular programs but may shed light on certain environmental ethics. I wonder, though, if a binary distinction between value-endorsing and non-value-endorsing positions is helpful in developing the open-minded model of environmental education that Burns and Norris (2009) argue is in order. Where does this kind of distinction leave educators who are connecting science education to advocacy in ways that respect students’ choices about how to enact their personal ethics? The authors acknowledge the improbability of value-neutral science education, but the dichotomy that they establish intimates that science educators must select a pedagogy from one of two boxes: loaded and manipulative, or objective and morally ambivalent. Clearly, a more flexible system of understanding the complexities of value-positioning within education is needed. In a science classroom, teachers, students, and the course curriculum all come with some manner of moral orientation. The degrees to which these perspectives are resonant or dissonant are context specific and may be unknown until the teaching and learning unfolds in the moment. Assuming that values are necessarily “in the room” as science education occurs, and that open-mindedness is a virtuous characteristic of science education, why is it necessary to eliminate the possibility of advocacy as pedagogy? Is it impossible for science teachers to design opportunities for social advocacy in ways that empower student decision making? I contend that these kinds of experiences are vital in connecting science education with the “real lives” of students, and that advocacy-based pedagogy needn’t be felt as incompatible with open-minded inquiry, and a plurality of moral orientations. This objection is closely related to my second concern with regards to a critical reflexivity in science education.

Just as teachers and students come to science classrooms with a plurality of value orientations, the domain of science is imbued with epistemological assumptions that, when left unexamined, may translate into value-endorsements similar to the kind that Burns and Norris (2009) eschew. For example, Nadeau and Desautles (1984) postulate that the concept of science most commonly enacted in high schools is one of scientism, which they describe as a:

type of creed that embodies various articles of blind faith in the scientific activity. The primary function of such a dogma seems to be to inculcate in the minds of young students a receptivity to the various types of scientific information they will be required to retain. (p. 13)

The implication of this statement is that the legitimacy of science knowledge may be reified to the extent that commonly accepted parameters of science inquiry are placed on a pedestal beyond the reach of the critical questioning that is necessary for open-minded education. In the decades since Nadeau and Desautles’ (1984) publication, the flavour of science epistemology and thus academic discourse of science education has shifted significantly. Hodson (2003) characterizes this transformation as a:

shift from the view that scientific knowledge is universal, coherent, objective, and unproblematic towards recognition that it is sometimes uncertain, contentious, and unable to provide clear, unambiguous answers to many important questions. There is increasing recognition among science

educators that science is a product of its time and place, inextricably linked with its sociocultural and institutional location, and profoundly influenced by its methods of generation and validation. (p. 647)

Hodson (2003) supports this shift in science education discourse and encourages further transformation towards a science education that empowers students to act as sociopolitical advocates. He also notes that while the discourse of science educators has shifted, school science curriculum has not been revised correspondingly. This lag between ideas widely held by science educators and the curriculum they are required to deliver leaves open the possibility that the vestiges of scientism discussed by Nadeau and Desautles (1984) continue to haunt science classrooms today. This possibility compels me to think about what constitutes science learning as education.

It is my position that, in order for science education to be considered education (and not, for example, training), critical questions about the assumptions of scientific epistemology must be broached. I further contend that the kind of critical questioning of scientific epistemologies that I (and others, like Hodson, 2003) encourage may well be achieved through student participation in advocacy-based science education. The experiential character of social advocacy may help students gain first-hand experiences which help them to think critically about when scientific knowledge is most helpful and when other ways of knowing are more useful.¹ Like Burns and Norris (2009), it is my position that curricular objectives and/or pedagogical strategies where “teachers answer important ethical questions *for* students” (p. 37, italics in original) are educationally dubious; however, I suggest that including aspects of advocacy in educational contexts does not *prima facie* suggest manipulation or indoctrination of students and that *how* advocacy is included in science education must be evaluated before it can be categorized as value-endorsing, non-value-endorsing, or somewhere in between. In the following sections I explain and justify possibilities for an open-minded pedagogy of advocacy in science education.

Advocacy in Education: An Epistemological Justification

Knowing that education and advocacy are contentious because of the potential for advocacy to undermine educational aims of independent critical thought (Hare, 1964; Peters, 1966, 1967), what justification might exist for including advocacy as a more central feature within a family of educational processes? I suggest that a justification can be grounded epistemologically. While other grounds could certainly be well argued (for example, ethical or pedagogical rationales), I focus here on epistemology because it is central to Hare’s concept of open-mindedness which is at the root of Burns and Norris’s (2009) concern for separating advocacy and education. Where epistemology is concerned, advocacy as an educational process has the potential to broaden the ways that students come to know the world, and may help students to construct new knowledge in ways that are not achievable through traditional teaching strategies (McLaren & Hammond, 2005). Including advocacy within educational practices may forward educational aims such as the development of valuable knowledge (Dewey, 1938) and provide opportunities to explore “the implications of science for society” (Burns & Norris, 2009, p. 35). While dogmatic teaching through advocacy is certainly undesirable, I argue that science (and other) education could serve as a window through which to teach students to be open-minded, critical, social advocates. In Burns, Picquette, and Norris’ (2009) language of virtue ethics: In what ways might educative advocacy help students learn to advocate well?

In a discussion of the aims of education, Whitehead (1958) notes that “...above all things we

¹ I have tailored my commentary in this paper specifically to advocacy in science education in response to Burns and Norris (2009); however, my sentiment about advocacy could well be applied to other discipline areas, and may best be implemented in an integrated, cross curricular context.

must beware of what I will call ‘inert ideas’—that is to say, ideas that are merely received into the mind without being utilized, or tested, or thrown into fresh combinations” (p. 13). In pointing a direction away from the educational pitfall of inert ideas, Whitehead suggests a possible solution “to eradicate the fatal disconnection of subjects which kills the vitality of our modern curriculum” (1929, p. 18). Whitehead’s charge that a fragmented curriculum leads to inert ideas may be viewed as a challenge for educators to deliver education in fresh ways that provoke students to move beyond memorization and categorization of facts and ideas, and toward making innovative connections between their developing knowledge and the context of their lives and communities.

One possible response to this challenge could be pedagogy that involves thoughtfully designed advocacy—particularly approaches that help students understand interconnections between their science knowledge and citizenship.² In describing advocacy as “thoughtfully designed,” I mean ways of taking up politically contentious issues through social activism, and doing so in ways that do not impart on students “particular views of the moral status of the environment, particular notions of the correct human relationship to the environment, or particular views of how humans ought to use the environment or view their impact on it” (Burns & Norris, 2009, p. 37). While a thoughtfully designed pedagogy of advocacy should not aim to inculcate students with particular moral views, it should most certainly help them to engage with a variety of moral perspectives on science and environmental education issues and to choose among them, or to choose not to choose if a suitable moral perspective fails to present itself. These choices are epistemologically significant because ethical positions are inextricably linked to the way that a person constructs and applies knowledge (Bauman, 1993; Cheney & Weston, 1999).

Advocacy, thoughtfully designed, may be a worthwhile activity that contributes to dynamic knowledge construction (Peters, 1966), and may make learning more meaningful to students. Direct experiences associated with advocacy can connect curricular knowledge in science-based environmental education with elements of citizenship and enable students to gain different kinds of understandings of ecological concepts. Such an approach to advocacy within education could allow students to have knowledge that is publicly enacted and not passively catalogued. In this way knowledge becomes not only a cognitive schema, but also a practice to be carried out (Cheney & Weston, 1999).

Arne Næss (Næss & Jickling, 2000) might name these experiences and practices “gestalts” (p. 53), or whole experiences, described as “spontaneous experiences that you are confronted with every moment” in which “you have as near a relation to reality as you can have in mathematical physics” (p. 52). Næss suggests that such embodied experiences have a cognitive importance that is often undervalued; these experiences help us to know the world in very real ways that often cannot be verbalized, but only experienced. These kinds of experiences cannot be scientifically falsified or otherwise taken away from an individual (Jickling, 2009; Næss, 2008; Næss & Jickling, 2000). Rich spontaneous experiences can function like anchors to which we may connect the abstractions of reality that constitute many learning experiences, particularly those that happen in the context of schooling. For education, advocacy can offer opportunities for students to connect abstract “objective” knowledge with gestalt experiences that may allow for meaning making that resonates with Whitehead’s “passionate protest against inert ideas” (1929, p. 13).

Jickling (2009) brings Næss’ thinking on gestalt experiences into the arena of resistance (or, advocacy as Burns and Norris [2009] refer to it). Jickling suggests that these kind of experiences are unpredictable and can’t be measured, but that it is exactly these spontaneous features that coalesce to make learning through experience so profound. Two examples of the kind of educative advocacy that I am suggesting come to mind; both are connected to the issue of global climate change, which is central to the science education focus of Burns and Norris’s (2009) paper. In one example, students might write and send letters to media or community leaders expressing a perspective on climate change. For

² While it could be argued that citizenship education falls outside the domain of science education, I would agree with Noddings (2005) that moral education is best conceived in integrated or cross-curricular formats.

others, coordinating and implementing the planting of trees somewhere in their community could be a more tactile or kinesthetic approach to advocacy that may provide a way of coming to know plant biology that would be difficult to achieve in a traditional classroom. Both of these examples could provide skill-building opportunities for students (in writing an effective letter of concern, organizing an event, or planting a tree), while at the same time showcasing for other students and the wider community that climate change is an issue of importance to young people. Well facilitated, these examples could allow students to construct new curricular content knowledge as they engage with questions of their own social values and how it is best for them to advocate in support of these values; such a student-driven approach would seem to be more educative than doctrinaire.

Some might comment that neither of these activities are especially radical political statements; however, if well planned and facilitated, students could be encouraged to reflect on activities in ways that highlight aspects of political engagement inherent in their actions. In both of these examples, the activities could be differentiated in ways that provide students with choices to conduct advocacy that is interesting, relevant, and comfortable for them. For instance, two students might write letters from different points of view or write to different recipients based on their individual prerogatives around climate change. Relating to the second example, different groups of students might plant trees in locations with varying political significance—the school yard may be a politically safer location, while planting in a public space slated for development could be more political. These examples begin to illustrate ways that differentiating activities within a curriculum (Tomlinson, 2001) may provide options to students. Choosing among these options (or developing their own) can create opportunities for students to consider various positions and make judgments about how they would like to proceed. Asking students to engage with environmental ethics in science is epistemologically significant because considering values also means considering what kinds of knowledge are valuable and how knowledge can be applied to solving socio-ecological challenges such as climate change.

Offering students choices about how activist processes are included in their education resonates with Hare's (1979, 2000, 2003) concept of open-mindedness; providing choice means educators can avoid imposing their own views onto students through activist learning and create space for exploring multiple positions around an issue. Within such a space, dialogue can unfold within a learning community that permits students to navigate their own ethical positions as well as to develop cognitive practices and capabilities that make open-mindedness possible. In this way, advocacy conducted within education may be justified because it furthers educational aims. Here, I assume that open-mindedness is a primary aim of education. This justification may be thought of as epistemological because the embodied or felt knowledge that can be developed through participating in advocacy experiences both broadens and deepens the way that learners can know the world. Knowing with greater breadth and depth creates a greater capacity for demonstrating characteristics of open-mindedness. Hare (2005) notes that "an open-minded person is ready to entertain an unusual point of view, to admit that an unwelcome conclusion indeed follows, and to concede that a position presently held needs to be revised" (p. 16). A breadth and depth of knowledge gained through experiences such as those provided through carefully designed advocacy feeds the development of habits of mind, dispositions that lay the groundwork for a disposition of open-mindedness.³

While not all advocacy may be educationally appropriate, as the tone or approaches used may depress aims of education (Dewey, 1897; Peters, 1966; Whitehead, 1929), thoughtfully designed and implemented advocacy can forward educational aims. What then is the nature of thoughtfully designed advocacy and in what ways can it be educative? In the following section I will outline some criteria that I think make educative advocacy possible, with specific attention to the potential of developing open-mindedness through participation in advocacy within science-based environmental education.

³ Examples of habits of mind might include, for example, persistence, attentive listening, and clarity of thought (Costa & Kallick, 2000).

Advocacy and Open-mindedness

It seems clear that what goes on in schools cannot rightly be called education if students are manipulated, coerced, or told what to think and not encouraged to question what is presented by their teachers (Barrow & Woods, 2006; R. M. Hare, 1964; W. Hare, 2000; Peters, 1966). My intention in providing the preceding justification for advocacy in education is to suggest that advocacy can support the development of dynamic thinking and needn't necessarily be viewed as a tool of indoctrination or coercion. Hare's (1979) notion of open-mindedness is one quality that steers education away from doctrinaire approaches to teaching and encourages independent critical thought on the part of students. Considering the justification that I have provided for drawing advocacy more central to education, does the idea of open-mindedness conflict with advocacy as a pedagogical process? I purport that the two concepts needn't be viewed as mutually exclusive. Much like "poor education may contribute to the kind of person who is incapable of open-mindedness" (Burns & Norris, 2009, p. 38) so too, poor advocacy may inculcate closed-minded attitudes about whatever issues are being advocated. An example of such poor advocacy might be a campaign that is so ideologically driven that a dogmatic certainty of belief marginalizes the kind of intellectual humility that forms part of what it means to be open-minded (Hare, 2009).

Knowing that such examples of poor examples of advocacy are possible in science education, as Burns and Norris have pointed out, what then are qualities that characterize advocacy that is copasetic with open-mindedness, and thus with education? In considering this question, two related criteria come to mind that can provide a "buffer" of sorts between students and miseducative advocacy experiences (Dewey, 1938). First, advocacy that endeavors to have open-minded educational qualities should be designed and facilitated in ways that create space for individuals (students, teachers, community partners, etc.) to engage in open dialogue about the issues being addressed so as to avoid unquestioned transmission of "knowledge" about contested issues. Second, educative advocacy at its best offers students and teachers the opportunity to engage with ethics, and reflect on how they go about enacting their own ethical positions on a day-to-day basis. Each of these points requires a brief explanation in order to highlight ways in which they enable possibilities for open-mindedness.

Creating Space for Dialogue

Næss (Næss & Jickling, 2000) notes the importance of "relaxed debate on a large scale" (p. 50) in considering contentious issues within education. Relaxed debate is characterized as a respect for a diversity of opinions among participants—a space where dissent is welcome, and dialogue is critical but friendly. Conducting such dialogue on a large scale has two implications that are resonant with open-mindedness; first, there is no rush to reach any conclusion, but rather a focus on continuing discussion. Second, learning that is gained from large-scale debate is "big picture"—that is, it highlights the interconnectedness of issues rather than fragmenting students' thinking. Both of these qualities of relaxed and large-scale debate highlight the potential for developing open-minded thinking habits through advocacy that is carefully designed so as to be educative. Another benefit of respectful dialogue as part of a process of educative advocacy is that it may act as a venue for participants (both students, teachers, and others) to consider their own ethical positions.

Ethics and Educative Advocacy

Dialogue initiated as an integral part of activist processes in education can provide a space for students and teachers to engage in intentional reflection on their own ethical positions. Just as advocacy in education allows for the enactment of knowledge, ethics are also enacted through the process of doing and reflecting on advocacy. According to Breunig (2005), this praxis is "reflective, active, creative,

contextual, purposeful, and socially constructed” (p. 111). Taken up as praxis, ethics can become a lived process, and not a static code to be followed blindly. Rethinking ethics as a process (Cheney & Weston, 1999; Jickling, 2004) allows for its enactment through advocacy to become a means of developing open-mindedness as an ethical habit-of-mind. Conceiving of ethics as a process moves its focus away from codified schema and towards living principles that are open for reconsideration as new experiences and knowledge emerge. Thoughtfully designed activist experiences can, I argue, be integrated into educational contexts in ways that further educational aims by promoting the development of open-mindedness. Taken up within the context of environmental education, such advocacy can create space for students and teachers to interrogate unquestioned assumptions (Evernden, 1985).

Conceptualized this way, Burns and Norris’s (2009) dichotomy between value-endorsing and non-value-endorsing approaches to environmental education may be blurred through advocacy-based pedagogies that promote student choice and autonomy. Approaching contentious issues this way means that advocacy needn’t be polarized as coercively loaded or politically sterile. Rather, students and teachers dialogue in a “mediated and negotiated third space” (Jickling, 2003, p. 24) that falls in between these two poles. It is within such a space that educative advocacy can provide opportunities for students to begin or continue developing the skills associated with Hare’s (1979) virtue of open-mindedness.

Towards an Open-minded Model of Environmental Education

Burns and Norris (2009) offer recent work by Reiss (2000) as well as Jickling and Wals (2008) as examples of open-minded approaches to environmental education. While I agree that these authors’ work represents open-minded conceptions of environmental education, I would contest categorization of their work as non-value-endorsing as both make reference to the transformative power of education, or of the power of educated people to effect change. Reiss (2000) notes that “science education has the potential to serve as a platform for resistance” (p. 19) while Jickling and Wals (2008) state that,

much traditional debate has turned on whether education is about social reproduction or about enabling social transformation...If enabling social transformation is the inherent expectation, then we would expect to find ‘educated’ citizens who are active participants in on-going decision making processes within their communities. They would be democratic practitioners...(p. 8).

Reiss’ (2000) suggestion could certainly be interpreted in manipulative ways. However, coupled with Jickling and Wal’s (2008) sentiment of educated citizens as democratic practitioners, the idea of science education as a platform for resistance takes on a tone of student empowerment. Understanding science-based environmental education as a means of giving students a voice for making change in their community without presuming to tell them what to say with that voice seems like a step in the direction of an open-minded model of environmental education that Burns and Norris (2009) describe. While none of the authors present a case for implementing particular value solutions, simply advocating for social change constitutes a value position to a certain degree. This observation dovetails with my earlier problematization of Burns and Norris’ (2009) dichotomy between value-endorsing/non-value-endorsing approaches to environmental education.

Conclusion

While I am supportive of Burns and Norris’s (2009) caution towards integration of advocacy in education, I believe that success in developing an open-minded model of environmental education lies

not in a dichotomy where value-endorsing approaches are necessarily doctrinaire and non-value-endorsing approaches are assumed educative. Rather, moving towards open-minded approaches to environmental education depends on developing a “mediated and negotiated third space” identified by Jickling (2003, p. 24) where advocacy can be conducted in education in ways that help students to learn about and practice what it means to be an engaged citizen, and ways that good advocacy contributes to good citizenship.

In this response to Burns and Norris, I have suggested an epistemological justification for including advocacy as a more central process within the concept of education. Grounding the integration of advocacy and education in epistemology means that students can come to know the world they inhabit more deeply and broadly through activist experiences. These are experiences of praxis and they engage students in dialogue that encourages ethical thinking—without pressure to come to final answers, but rather to promote ethical engagement as a day-to-day process (Jickling, 2004). I think positioning advocacy within education this way aligns it with Hare’s (1979) concept of open-mindedness. I have argued that advocacy and open-mindedness are not incompatible concepts and that prohibition of advocacy in science education (or in education more broadly) may eliminate rich learning opportunities from education. While I think that a cautious stance towards advocacy in education is wise, I believe that efforts at separating advocacy from science education should be refocused towards identifying ways of understanding how good advocacy contributes to good education that is aimed at fostering open-mindedness.

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