

## **EDITORIAL:**

### **In response to Global Warming and Climate Change**

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#### **Responses**

Please consider writing a response to this paper in the WePaste forum for JASTE 3.1 ([www.wepaste.org](http://www.wepaste.org)).

What drives the authors assembled in this edition of the *Journal for Activist Science and Technology Education (JASTE)* is the prospect that education in all of its diverse settings, disguises and narratives might more thoughtfully, more rapidly, and more progressively, act in response to climate change and global warming. The articles speak to desires of educational practitioners, policy-makers and researchers taking much more seriously what is perhaps the greatest challenge that humanity is currently facing.

The articles that follow outline particular pedagogical and curricula innovations that draw sustained attention to the multiplicity of ways in which particular groups continue to mobilise and forge dynamic responses to this truly global threat. These responses, and many others, must be shared and celebrated. They also bring attention to the seeming ‘inactivity’ of other groups. We are thinking here in particular of powerful governments, multinationals and large public and private educational institutions that have yet to respond in a manner that is commensurate with the seriousness of the situation that we are presently facing. Quite simply, we hope that discussions in the following eight articles make contributions (however modest and wherever possible) to enhancing roles, voices, concerns and agencies. It is our collective wishes that administrators, teachers, learners and researchers in both formal and informal contexts more intensely and more purposefully develop distinctive and diverse voices and actions that expand our socio-cultural and political responses to global warming and climate change. Such responses offer opportunities to mobilise in solidarity with other social movements and individuals from around the world, many of whom are suffering the most from global warming and climate change, but are the least responsible for these changes.

In bringing this edition together as editors, we were simply delighted by responses to our original call for submissions. The data from the JASTE website suggests that the e-journal is receiving increasing attention with a growing number of visitors to the site, and impressive figures for the number of articles that are being downloaded. This issue of the journal adds to the range and diversity of topics, perspectives and arguments that have been explored so far. It brings together both senior and newer scholars within a combined exploration of education in response to a massive concern. We are thrilled to be able to showcase the work of our colleagues and we have learned much, and continue to learn from their ongoing research and scholarship.

Global warming has become predictably synonymous with raising levels of greenhouse gases (GHGs) resulting in changing atmospheric conditions. These changes have brought about a series of associated effects including increasing melting of ice caps, rising sea levels, flooding of coastal communities, increasing desertification, spreading of diseases and chronic biodiversity loss. Such changes are widely known. They have been the focus of enormous concern and widely reported debates in diverse cultural and political institutions and in the wider public sphere. Much global attention and hope has been given to sporadic international policy meetings in venues such as Kyoto, Copenhagen and most recently in Cancun. These meetings, however, have failed to reach an agreement, let alone produce binding and enforceable policies that would ensure systematic and progressive measures are put in place to reduce greenhouse gas (GHG)

emissions. Indeed, perhaps they have achieved little more than to highlight the enormity of the task ahead and how deeply dysfunctional existing negotiation mechanisms seem to have become.

As education practitioners, administrators, policy makers and researchers, a question that we are all grappling with is how should contemporary educational interventions in particular contexts respond to global warming and climate change. This seems all the more pressing in light of Spencer R. Weart's comment that given the anthropogenic origins of increasing greenhouse gases, the future of the climate 'depends in part on what we think about it' (Weart, 1998, cited by Leduc, 2011; 10). The assembled authors in this journal issue, in many ways, take this comment further, suggesting that the future of the climate also depends, in part, on how 'we' teach and how 'we' learn about it. It depends, in part, on education.

In such statements, however, our educational responses should remain vigilant and reflexive of the ways in which some educational responses to 'climate change education' (CCE) might be serving to mask more political, historical and situated considerations of educations and actions related to global and local inequalities and injustices. Such considerations need to unpack the seemingly uncontroversial and common uses of the terms 'we' and 'education' by recognising differences in the necessary actions and educational needs of individuals and groups that have different ecological and carbon footprints and responsibilities (both historically and presently). In this regard, climate change educations (plural intended) need to be contextualised, differentiated and distributed. They should consciously recognise the differing impacts and varying situated and economic responsibilities that climate change evokes. Yes, global warming is a shared Earthly concern, but different individuals, groups and nation states are implicated in different ways and to different extents. Climate change educations cannot conveniently overlook the origins of anthropogenic emissions and perhaps what are uncomfortable questions of associated injustices and imbalances. Rather, climate change educations must remain attentive and actively disclose situations in which people are most affected by listening more carefully to individuals, groups and governments who are experiencing the greatest impact of climate changes and yet continue to mobilise, share and innovate in dynamic and creative ways (such responses include innovations in education, of course). Moreover, we must recognise the fundamental interdependence of all life on Earth, and how climate change is dramatically impacting plant and animal species.

In more wealthy countries, educational practices might more readily disclose and more openly acknowledge the 'special-educational-needs' of communities, governments, organisations, companies and individuals who have excessive ecological and carbon footprints. It is here, arguably, where the greatest educational responsibility and burden is to be found, and where the most profound changes must occur. While poor inner city communities and rural areas are often the focus of a succession of educational interventions and deficit models, it is the very wealthy communities of the suburbs, the rich executives of multinational companies, and leaders in governments with the very largest personal and institutional carbon emissions that require most attention. This is where our most progressive education reforms are needed and where our greatest remedial work is urgently required.

In the popular media, revelations of the public's 'climate illiteracy' are everywhere. Illiteracy is created by measurements of peoples' misunderstanding of basic weather and climate concepts, their conceptions of simplified models of how global warming works and the greenhouse effect. The fallacious argument then follows: if only teachers could teach children these things properly and then we wouldn't be left with such massive widespread confusions, apathy and inactivity. It is often accompanied by; if *only* the public knew more of these facts about global warming then they would all see the errors in their ways. The following articles bring attention to a number of very different ways of understanding climate change. These include: an appreciation of the human origins of global warming; where the effects of global warming are most felt (and where they are least felt); the experiences of groups that are confronting the effects of climate change; and how dominant cultural, political and economic forces continue to perpetuate responses that serve to widen (rather than narrow) ecological and social injustices. The problem, quite simply, is not with "the climate" or the widely reported uncertainties in climate science. It is not about "Climate-Gate" or whether

citizens can effectively and efficiently remember a definition of global warming, or draw an acceptable picture of the Sun's rays and a GHG blanket. Neither is it that we lack technological innovation and have thus far failed to find the "techno-fix". The problem - actually the crisis - is the combined and individual actions of many mostly-wealthy governments, companies, institutions and people who continue to add to historically established inequalities and injustices through their everyday activities.

The authors assembled in this edition offer broad, deep, pressing and critical inquiries into education. These inquiries draw sustained attention to innovative pedagogies as well as the importance of more profound cultural and ecological changes in the ways in which we should understand and practice knowing, and the processes of education and schooling itself. This line of thought connects global warming and climate change to particular dominant worldviews, specific ways of being in the world and knowing the world. It also makes connections to wider systemic political forces, economic and historically established practices. When combined, the authors collectively argue that within the context of science and technology (and other subject areas as well), education should not be reduced to covering a series of all-too-familiar isolated scientific facts and, in so doing, reinforce models of the environment that are human centred and predominantly resource-based. Moreover, education should not only offer solutions in the form of mitigation that is *always and only* individualised, consistently serving to accentuate individual freedoms and personal liberties. Such actions might include, for instance, changing to florescent light bulbs, or buying a Toyota Prius, or purchasing another green vehicle or product. There are other considerations and actions that *also* need to form the focus of our practices and policies.

The following articles take very seriously the pedagogical responsibility of climate change being part of the science and technology curriculum. Advances in science and technology have effectively brought to our attention anthropogenic induced global changes. Scientists and technologists from around the world in a vast array of disciplinary fields, including climatology, meteorology, atmospheric chemistry, ecology, geology, oceanography, botany (and many other fields as well of course), offer such critically important and powerful expertise. As educators and researchers, we need to recognise this growing expertise and its complexity. We must also be aware of other expertise that is also crucially important but can become lost within common and dominant cultural assumptions and institutional practices. To pedagogically equate global warming and climate change education with school science and technology education seems both appropriate and natural. It has been the approach of many (if not most) school curriculum policy documents around the world. However, the seemingly obvious can too easily, and perhaps too readily, serve to reinforce and enact entrenched cultural hierarchies, assumptions and associations. Such assumptions and associations continue to require our urgent reflexive thoughts and actions. Above all else, the following articles offer an evolving conversation that unpacks some of these common, familiar and easily overlooked pedagogical and political manoeuvres.

The *Journal for Activist Science and Technology Education* was established to inform and enable conversations and actions about three broad pedagogical themes - disclosing, mobilizing and celebrating. Our intent was to discuss and shape activist-led pedagogies, policies, practices and epistemologies. We wanted to offer a forum for sharing experiences and expertise with extended, open, tentative and humble dimensions. We sought a collaborative, open-access and not-for-profit forum that showcases colleagues' work and inquires into some of the possible differences and associated benefits and weaknesses of activist-led science and technology educations and research. An activist-led science and technology education and research, we believe, is different in some significant ways to science and technology education and research that relates to action. It is more than an extension of traditional education and research practices applied to a new area, a new context, or a different situation. Activist education and activist research call into question some basic pedagogical and epistemological hierarchies that assume specific relationships and hierarchies amongst education, knowledge, values, politics and actions. Activist education and research hold tightly onto the importance of both knowing-well and doing-well. And in so doing, perhaps, question what Cheney and Weston (1999:116) call the 'seemingly most obvious assumption of all, that the world consists of a collection

of given facts to which we must respond'. This most obvious assumption, we think, needs more careful attention.

In many educational practices in schools, museums, centres and the popular media, knowing-well always appears most important and is self contained. Doing-well - in contrast - is implicitly cast as a secondary response: a response that is always *after* and, in some ways, mainly *separated* from knowing. The philosophical reasoning is that we first need to learn the world and then act based on our knowledge of the world. But what if our actions and our intentions of acting, our purposes for knowing, actually change our way of attending to the world? What if our ways of knowing the world are fundamentally influenced by our desires, expectations, interests, purposes and hopes for knowing? Whose voices get to count in knowing and education, and whose do not?

In creating this e-journal, we hoped it might gather some educational thoughts and actions together that recognize some of the tensions associated with hard separations of 'knowing-well' and 'doing-well' (separations of knowledge and values; knowledge and ethics; knowledge and politics). We wondered if we could disrupt some of the more dominant educational assumptions by *starting* with expectations and desires of doing-well with particular and specific groups, places, spaces and times always in mind. Our reasoning went; what if we commence education with explicit desires and intentions of actions and recognising the political, ethical and moral dimensions of *all* acts of being in the world? We thought such a reversal of tradition (a reordering of the obvious) seemed to 'change things up a bit'. It offered a succession of questions and possibilities as well as - of course - limitations. Some of the questions that colleagues continue to grapple with in the articles in this special edition and in other editions of JASTE include; what can local curricula and pedagogies look like if they were *led* by activism, rather than led by knowledge and seemingly disavowed from values, politics and action? What knowledges and actions might emerge through pedagogies that seek to build communal responses to knowing-well concurrently and inseparably while doing-well?

What brings the authors together in this issue of JASTE is a desire to explore educational responses to climate change and global warming that build from intentions of acting and recognising the ethical, political and ecological implications of all actions. The assembled authors explore science and technology educations that notice ecological and social imbalances, inequalities and injustices. In their educational responses, they acknowledge the situated and constitutive nature of climate change *and* climate justice (and hold tight to the possibilities of climate science as/for climate justice). In so doing, they reach out for expertise in science and technology as well as expertise from many other groups, including those most familiar and most affected by increasing changes. As Anders Sandberg and Tor Sandberg (2011) bring to our attention, such groups include people living near the 'Tar Sands in Alberta, the Gulf of Guinea in West Africa, The Canadian North, the coastal regions of Bangladesh, and the Island State of the Pacific' (p8). Moreover, climate change is not about humans and human expertise alone. It is abundantly clear that anthropogenic emissions are impacting biodiversity and that changes in biodiversity are further impacting the climate. The interdependence of biodiversity and climate change requires responses to them together.

David Selby starts these conversations off brilliantly with a critique of development and passionate defence of Education for Sustainable Contraction (ESC). He drags our attention away from externalising the crises in the climate and eloquently steers our attention toward the real culprit that is human and cultural in origin. Underpinning these actions is the inability of the minority wealthy world to recognise the madness of its current and historically destructive actions. Selby's focus is on disclosing Western worldviews and the ways in which they repress meaningful and necessary relationships with nature. He highlights how a catalogue of recent well-meaning educational and development initiatives serves to repeatedly inscribe divisions between nature and culture. In the spirit of the actions of Martin Luther King, Selby expresses the desire to nail nine propositions to the doors of our educational institutions. In this editorial, it seems fitting and appropriate to repeat these and in so doing underscore their importance.

### Nine Propositions for Education for Sustainable Contraction

1. A concerted effort is needed in the light of looming runaway climate change to confront denial by moving learner assumptions, understandings and responses towards disequilibrium (fomenting dissipative structures).
2. Given the likely impeding severity of global heating, Education for Sustainable Contraction needs to address despair, pain, grief and loss.
3. Given the powerful wave of neo-liberalism rolling over the planet, destructive of ecosphere and ethnosphere, climate change needs to offer alternative conceptions of the 'good life', combat consumerism, and help learners explore and experience alternatives to a growth economy.
4. The view of human<>nature relationship needs to shift from the doministic, the instrumental and the exploitative to one of embeddedness and intrinsic valuing; from a shallow ecological to a deep ecological paradigm.
5. The embrace of intimacy with nature calls for the cultivation of the poetic.
6. Educations that have been marginalised within education for sustainable development are important.
7. With global heating under way, sustainability education and emergency education need to fold together.
8. Cozy assumptions about the relationship between education for sustainability and education for citizenship need unpacking and formal and informal learning programs need to offer alternative and localized conceptions of 'good citizenship' (or good denizenship).
9. Everyone has to understand and come to terms with the fact that we are threatening our own existence. To confront this requires a Copernican revolution in our view of the world and in the aims, structures, processes of education and, perhaps, in the loci of learning.

In the second article, Leo Elshof provides a comprehensive review and analysis of 'inaction' and the prevalent 'inactivist' climate change movement. He exposes the array of people and organisations that are working to maintain the *status quo* with respect to increasing greenhouse gas emissions. As Canadians, it is embarrassing and uncomfortable reading about the responses of our government (very recently re-elected with a parliamentary majority). The story of climate change in Canada is linked to dominant economic models of growth and the seeming 'advantages' of Alberta's and the melting Arctic's rich oil and gas reserves. As Elshof astutely writes:

Although stories in the corporate business press frame the retreat of the arctic sea ice due to climate change predominantly as a good news story, a opportunity to make even more profit by the oil, gas and minerals multinationals, the story for indigenous peoples and the biodiversity which has supported them is far less rosy (p16)

Elshof highlights the significance and possibilities of technological progress, but also warns of the inherent dangers of overlooking some of those very difficult questions that surround responsibilities for climate change. Canada alongside many other countries has invested in carbon-markets and carbon sequestration technologies, although as Elshof notes, these are unlikely to make anything more than a small indent in the problem. A significant dimension to the climate problem is the myth-of-ignorance perpetuated by dominant communication approaches amongst some scientists and policy makers. These approaches are coupled with a media disinformation industry that focuses on generating doubt and accentuating short-term self-interests in place of collective long-term interests. The public debate seems to be perpetually focused on questions of knowledge and what we know for sure about the climate. The manufacture of climate doubt, however, by those in high governmental circles has never been a quest for epistemological clarity, for continued research, but an ideological epistemological smoke screen for maintaining liberal freedoms and avoiding any central governmental involvement. In response, climate change education must, Elshof asserts, sustain multiple opportunities for learners to analyse how 'anti-science, narrowcast blogspheres create self-referential echo chambers of myopic opinion'.

Michael Bowen offers a compelling personalised narrative about his encounter with global warming and more recent experiences in a graduate journalism degree. His reflections offer a brief overview of selected literature on news-media and global warming science and then focuses on what have been described as 'new media' or 'Media 2.0'. Michael follows this with a semi-insider reflection on the cultural and materials practices of print news media communities and how these fundamentally shape news production. The importance and significance of news media in shaping public perceptions has been widely documented. Bowen's case study offers a rare, detailed and embedded case study of modifications of language and meanings. He exposes the active process of making news through a detailed analysis of copy story modification and the ways in which this forms a broader cultural pattern of production. Such cultural literacy practices, as Michael notes, are not helped by lack of subject knowledge expertise and the paucity of journalists with backgrounds in science and technology. Moreover, the seeming unquestioned belief in the 'instant expert' and 'instant news copy' has become widely accepted in cultural practices of news-media production and also in the practices of journalism education itself. This has considerable implications for the public with respect to socio-scientific issues and public opinion. Indeed, Michael persuasively argues that, in many cases, it is the 'loose language' of journalists that provides a foundation for those who wish to argue against the science of global warming. The article concludes by turning attention to schooling and hopes of critical media studies. It ends by questioning school science and how it is often underequipped, and poorly prepared to handle the complexities of most scientific ideas that 'feature' in the popular media. In this respect, Michael questions whether schools should focus on sociological accounts of climate change rather than scientific perspectives.

Laura Colucci-Gary and Elema Camino, from the Interdisciplinary Research Institute University of Turin, Italy and the School of Education Aberdeen University UK respectively, offer a series of reflections on the perspectives and educative hopes of a framework of sustainability science. Their article carefully and insightfully articulates and advocates a dialogical approach to knowledge production by valuing epistemic and reflexive knowledges from diverse cultural, material and historical contexts. Drawing on over 15 years of participatory research and a conscious awareness of the axiomatic importance of active citizenry within and era of increasing ecological concerns, Colucci-Gary and Camino call for different ways of knowing and different ways of teaching. They offer opportunities to question dominant assumptions about knowledges and how these should be re-valued and re-worded. They describe the aim of their participatory and interdisciplinary work as

Recomposing the fracture, contextualise situations and allow young people to enter into direct forms of dialogue, by putting into relation the body with the emotions, images and languages – and so to give meaning to the many scientific concepts that by means of such activities can be acquired and integrated.

The constructive transformation that they outline has a heart of non-violence and contemporary political culture as the basis of generating sustainable changes.

Meghan Marrero, Bradford Davey, Hilarie Davis and Glen Schuster from the U.S. Satellite Laboratory report results from a large-scale international teacher education research project that was funded by the National Science Foundation. They outline a pedagogical project, SPRINTT (Student Polar Research with National [and International] Teacher Training project. The project comprises three phases focusing on the upper elementary, middle and high school grades. In brief outline, these phases are: (i) students using hands-on and technology supported activities to make connections between their lives and lives (human and more-than-human) in the Earth's Polar Regions (This phase offers opportunities to explore scientific and Alaska Native ways of knowing); (ii) an optional standards-base series of science lessons exploring key atmospheric concepts and biodiversity data; (iii) student centred inquiry projects in which participants seek to combine western scientific and Alaska Native ways of knowing to conduct their own research on polar regions. Curriculum materials and web-tools support these pedagogical phases. The number of students and teachers involved in this project is extremely impressive and very encouraging. In the second part of the article, the authors turn their attention to exploring the impact of this project. Using a stratified random sample of

student research papers and examples of particular students' projects they provide a qualitative analysis that offers evidence of the students' increased understanding of polar concepts and research processes.

Rebecca Houwer, a co-editor of this issue, broadens our discussions by contemplating the pedagogical possibilities of crises. She draws attention to the proliferation of courses in a large urban multicultural comprehensive Canadian university that have the term 'crisis' in their titles and the more modest use of the term 'hope'. We suspect that this is similar in many other universities, and there might even be an argument that we over dwell on the term 'crisis', which is used increasingly with alacrity, freedom and much abundance. It seems almost that for something to be worthy of our sustained attention it has to be framed as a crisis, and the word ecological seems bare without it. Houwer asks if there is something pedagogically distinctive and enabling that "notions of crises" provide learners and teachers. Her paper is structured in three sections. In the first, she defines crisis and examines how it might be pedagogical. The second section explores barriers and tensions of learning through crises and, in the concluding sections, she discusses opportunities "crises" might offer education and concludes with suggestions of transformation and learning.

The article from Margaret Hayden, Rebecca Houwer, Michael Frankfort, Josefina Rueter, Teresa Black and Paul Mortfield plays with questions of knowledge, education and certitude. They delightfully describe their article as a "gathering", or "assemblage" of perspectives (cf. Latour and Heidegger) on the pedagogical nature and possibilities of uncertainty in climate change and climate change uncertainty. We are struck by one of their early questions that asks; how are our responses (or lack thereof) to climate change pedagogical? What might it mean to frame the pedagogical in more complex and dynamic terms than a cure for conceptual confusions and a response to societal ambiguities and concerns? In this article, the authors offer different personal perspectives in response to different contexts and agendas. They use four articles as a structure to explore some uncertainties in their own collaborative inquiry and to confront some of the 'repressive myths' (to use Elizabeth Ellsworth's term) of pedagogies *as* solutions.

Jenny Dauer, Carly Lettero and Melissa Ocana offer an insightful argument for the importance of ethical and moral reasoning within the climate change curriculum. They review a sample of existing science lessons that focus on climate change to explore the extent that aspects of a moral premise are evident. Their data highlights the relatively modest number of climate change lessons that incorporate equity, use of moral imagination and moral responsibilities. Indeed, none of the lessons that they reviewed offered moral responsibility as a main focus. These figures contrast sharply with the majority of lessons that contained thinking and reasoning skills. Their article concludes with reflections on their methodological distinctions and introduces three new lessons that they have developed that focus on ethical and moral reasoning for children in grades 5-9.

We would like to thank all the authors again for their willingness and patience in bringing this project to publication. To our knowledge, this is the first journal in Science and Technology Education that has dedicated an issue to Climate Change and Global Warming education. In itself, this is a pause for reflection and concern. Given the importance of this global threat and the ways in which science and technology educators are being increasingly called upon to respond, this seems an obvious oversight. We hope that other journals follow our lead and promote dialogue and exchanges about this axiomatic topic area. As always, we welcome feedback about this issue and the articles it contains on the PASTE website.

*Our next edition of JASTE will be exploring consumerism and global capital; bringing into conversation ways in which dominant economic models shape aspects of our practices and ways that we might respond. If you are interested in contributing to this discussion please contact Larry Bencze (larry.bencze@utoronto.ca).*

Thank you.

Steve Alsop, Larry Bencze and Rebecca Houwer

May 2011

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