Editorial:

Activism in SMT Education in the Claws of the Hegemon

Steve Alsop & Larry Bencze

We write this editorial in Toronto shortly before the G8/G20 summits. Political and economic leaders of the world’s 20 richest ‘economies’ are about to meet in our city to make decisions that could shape life, work, play, etc. of many of the world’s people. Nine-foot walls have gone up around the city core, both metaphorically and physically. Estimated to cost at least $1.3 billion, security measures are reported to also include: ‘sound cannons’ (Long Range Acoustic Devices) that emit painful and potentially hearing-damaging sound bursts; water cannons; high fences; surveillance helicopters and video cameras; snipers; heavily-armed shielded guards on foot, motorcycle, horse and in automobiles; electronic eavesdropping (on email, cell phone and Twitter™ messages); disrupted cell phone signals, transit services, and entertainment events; and, arrest and seizure on suspicion of ‘terrorist’ intentions. A Toronto newspaper writer comments:

…it says much about the state of our civilization that leadership — or what passes for it — has grown so wildly disconnected, distrusted and disliked by those being led that Canada feels it necessary to beggar itself to cover the cost of its own worst fears..... Cities, places of connection and accessibility, are inherently democratic. Because of the G20, Toronto has been turned into the antithesis of that. The symbolism as well as the facts of the meeting flies in the face of urbanity; the city will become a gated community where residents are not welcome (Hume, 2010).

How should we judge such events? Zygmund Bauman (2008) continues to reminds us of the delicate balance of freedoms versus securities. Such events also speak to visions of democracy that rest not only on appropriately structured institutions and elected leaders, but also fully embrace individuals and groups who question received doctrines, participate thoughtfully, and actively exercise democratic rights and responsibilities. This special edition of the Canadian Journal of Science, Mathematics and Technology Education (CJSMT)
explores activism in education. As editors, we are delighted to bring together eight thought-provoking articles that fuse scholarship, pedagogy and purpose. We would like to thank the authors for their willingness to share their research and the editor of the CJSMTE for the opportunity to shape this special edition. To our knowledge, this is the first mainstream SMT education journal to focus on activism, which we feel is an important statement in itself.

Our own interest in activism is bounded to scholarship and actions in keeping with democratic political theory. We consider students, teachers and researchers as important civic actors and take seriously Hannon and Tims’ (2010) position that “to tackle the challenges of tomorrow, young people need political capital today” (p. 1). However, although we openly recognise that within this position there is considerable space for debate and need for acceptance of a plurality of perspectives and practices, we draw some boundaries\(^2\). We offer this editorial and the following articles as an invitation to a conversation and not as a positional statement. Indeed, we would greatly regret if any of the arguments to follow contributed to divisions between research that aims to be ‘politically neutral’ and research that aims to be ‘politically informed.’ In this regard, a question that flows through all the following articles is how can scholars and practitioners with differing options and perspectives collaboratively extend our field in pursuit of academic, personal and social and environmental justice goals. As we write, we sense movement toward more normative work in SMT educational practices. We join with many others in celebrating changes that have brought increasing attention to social justice and environmental sustainability themes, contexts and commitments. Given the proliferation of work in this area, it is important to hold onto the possibilities and hopes that this work can be connected in ever more creative and fruitful ways. It is our assertion that activist orientated STM education and research have potential to add to this growing work in promising and progressive ways.

The term activism is wrapped up in a series of instituted social imaginaries (Castoriadis, 1998) that might be captured through a variety of definitions, each holding their own etymologies and nuances\(^3\). At the heart of such distinctions is desire to bring about change — whether it is personal, social, political, economic and/or environmental. The OED defines activism as a ‘policy of vigorous action in a cause, especially in politics.’ Other definitions cast light on the agent, the one who is politically active in the role of a citizen, campaigning for social and environmental change. In the context of education, such definitions already rub up against wishes of instructors and researchers to be set free from any commitments, values and distractions. Shrader-Frechette (2001) warns us of the dangers of trying to be too ‘scientific’ that we neglect our role as advocates and agents in the future. What concerns us most is the ever present tension in school-based reforms and ‘gold standard’ academic research of everything becoming so eminently measurable, quantifiable and seemingly objective that it loses sight of broader questions of purpose and context. In

\(^2\) While accepting a variety of different political perspectives, our use of the terms advocacy and activism does not include groups and individuals that work against the norms of democracy, equity, social justice, peace and environmental sustainability. We also recognise the partiality, inherent fluidity, contextuality and uncertainties of this perspective.

\(^3\) We are conscious that activism can become misrepresented as ‘the spectacle’ and separated from daily actions and civic responsibilities (see discussion in Angela Calabrese Barton’s article and the conclusion of this editorial).
complete contrast, the education and scholarship evident in this special edition is academically rich, robust and critically reflexive of being part of the world in which pedagogic actions and knowledge always generates consequences and carries wider implications. It is our collected assertion that such deliberate visions of STM education can bring learners, teachers, researchers and communities together in novel, fruitful and powerful ways, to look outward to the world and inward to the needs, hopes and the possibilities of change. Such considerations elucidate a shared hope that knowing-well and doing-well are ultimately entwined, wrapped in expressions of education that are more than banking basics for future study. Here we join with Maxine Greene (1995) in advocating and exploring norm-governed situations in “which students discover what it is to experience a sense of obligation and responsibility, whether they derive that sense from their own experiences of caring and being cared for or from their intuitions and conceptions of justice and equity” (p. 66). Such situations, we suggest, could be further enhanced when groups and individuals engage in socio-political actions with carefully researched and thought-through motives and intentions.

**Partisanship in research and pedagogy**

Through our choice of activism, we draw deliberate attention to partisan research and pedagogy. We openly recognize that our particular ideological commitments to social justice and environmental sustainability goals are political. After all, many inequalities and injustices link to pressing structural concerns about the state of the world in relation to global economic systems. There is a vast array of literature in education that explores questions of schooling and economic models. Several authors in this issue, including Lyn Carter, Leo Elshof and Matthew Weinstein, explore such questions. John McMurtry (1999), a prominent philosopher and social critic, suggests we are in a ‘cancer stage’ of capitalism. Although capitalism has existed for centuries, it has, he asserts, evolved in recent decades in ways that enable its ‘prime directive’ — to generate profit for the few through labour of the many — to compromise the wellbeing of many of the world’s individuals, societies and environments. Although regulation, generally by democratically-elected governments, of its for-profit activities has ebbed and flowed over the years, the last 2-3 decades have featured a series of actions by governments and supranational organizations — like the World Bank, World Trade Organization and International Monetary Fund — to increase capitalists’ abilities to generate profit. In the so-called *neo-liberal*4 agenda, restrictions on international trade have been reduced, labour and environmental standards and protections have been weakened and tax reforms and monetary policies have favoured corporations and the economic elite (e.g., Gabbard, 2000). Foucaultians would argue, of course, that part of the power of the neoliberal agenda is its *subliminal* nature. In a process known as neoliberal governmentality (Foucault, 1991), the elite’s hegemonic control of societal thoughts, discourse and actions — often mediated through their control of media and entertainment services — have many people convinced they are self-governed while they are being governed by the elite. Such capitalist virtues as individual responsibility and competition, standardization, privatization,

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4 Neo-liberalism is renewed economic liberalism, which refers to removal of impediments to private wealth accumulation. A special feature of neo-liberalism is that government intervention in markets is encouraged, as long as it amounts to ease of profit-generation.
and commodification are now often assumed to be normal — a set of guiding principles for life (e.g., Bowers & Apffel-Marglin, 2005; McLaren & Farahmandpur, 2005).

A central ethic of the neoliberal agenda is profit maximization through cost minimization, often accompanied by cost \textit{externalization}. Not only do companies — with the aforementioned government and non-governmental support — attempt to minimize labour costs, for example, they often find ways to ‘off-load’ (externalize) costs to others. This may involve publicly-funded education of potential workers and transportation and communication networks, but also costs often borne by the public due to negative side-effects of production, consumption and disposal of for-profit products and services. In this ethic, responsibility to others is a passive, rather than a pro-active, phenomenon. Indeed, such ‘side-effects’ can be devastating to the wellbeing of individuals, societies and environments. Bakan (2004) provocatively suggests that “the corporation [often actualizing neoliberal ideals] ... is an externalizing machine, in the same way that a shark is a killing machine” and that this makes it “potentially very, very damaging to society” (p. 20). The recent financial collapse, largely due to failings of de-regulated financial markets, and subsequent public spending to rescue banks has left many ‘average’ workers and homeowners less secure. Similarly, as we write, thousands of barrels of oil per day have been gushing for eight weeks from a deep undersea well in the Gulf of Mexico, causing untold environmental and social stresses. It remains to be seen what fraction of the costs of these ‘side-effects’ will be borne by the public.

Apart from some ‘short-term’ (arguably) crises — like the recent financial ‘down-turn’ — associated with for-profit products and services, there also appear to be numerous more \textit{endemic} problems (or potential problems). A potential problem perhaps overriding all others is Climate Change. According to the Intergovernmental Panel on Climate Change, for example, Earth is on course for catastrophic loss of life, assuming the currently-predicted average global temperature increases by about 6°C within the next 100 years (Lynas, 2008). We might also, however, be concerned about potential health and social justice problems relating to: expeditiously-produced and inadequately-tested ‘manufactured’ foods (e.g., Weber, 2009), pharmaceuticals (e.g., Angell, 2004), biotechnologies (e.g., Krimsky, 2003), toxic chemicals in everyday things (e.g., Vasil, 2007) and agricultural practices (e.g., Kleinman, 2003). While it may be understandable for scientists and engineers to protect information about their work because of intellectual property agreements between them and companies, it is perhaps more problematic when data is selectively reported to enhance perceptions about the quality of products — such as those about cigarette smoke, which often have shown to be damaging to people. Arguably even more worrisome are instances in which science investigations are compromised in order to expedite product development. For example, drug companies — often through arms-length research firms employed by them — frequently use small sample sizes, younger, healthier subjects [less susceptible to negative side-effects], lower doses than to be prescribed, and brief drug trials in order to maximize probability of drug approval (Angell, 2004).

\textbf{SMT education, research and activism}

Such examples make abundantly clear the constitutive relationship between science, technology and society. Here we explore an activist agenda that encourages teachers, students and researchers to adopt critical, perspectives while recognizing complexities,
uncertainties and ambiguities. There has been a long established history of research in Science, Technology Studies and Mathematics Studies that has been critical in documenting perceived epistemic failings and has been prescriptive in proposing and shaping alternatives. Indeed, activism has been a source of sustained attention, framed as a ‘reconstructivist current’ in response to more social constructivist orientated studies in the History, Philosophy and Sociology of Science and Technology (see Woodhouse et al., 2002). Social movements and their reciprocal relationships with knowledge production has also been a source of some attention (Hess et al., 2010). Such theorizing, we suggest, has much to offer educational research and practices.

In education it should not go unnoticed that many of the potential personal, social and/or environmental problems associated with for-profit production, consumption and disposal outlined above often are called socioscientific issues (SSI) (e.g., Zeidler et al., 2005), given the prominent role played by fields of professional science, mathematics and engineering in them (e.g., Hodson, 2003; Ziman, 2000). Due to the breadth and depth of socioscientific issues, many jurisdictions have placed increased priority on educating science students about such potential problems and about possible solutions to them. Zeidler et al. (2005) note that prominent educational organizations in many countries, including in Australia, Canada and the USA, “recognize the importance of broadly conceptualizing scientific literacy to include informed decision making; the ability to analyze, synthesize, and evaluate information; dealing sensibly with moral reasoning and ethical issues; and understanding connections inherent among socioscientific issues (SSI)” (pp. 357-358). In Ontario, for example, students’ understanding of relationships (including possibly problematic ones) among fields of science and technology and societies and environments is listed as the first overall goal for every unit of study and, moreover, students are expected to propose “…courses of practical action to deal with problems relating to science, technology, society, and the environment [STSE]” (MoE, 2008, p. 25).

Considerable progress has been made in development and research relating to students’ education about (and actions to address) socioscientific issues (e.g., Sadler et al., 2007; Simonneaux & Simonneaux, 2009). There are, of course, many different ways to analyze and evaluate these changes. Hodson (2003) (also see paper #1 in this issue) proposes that education in this domain can be found in at least four levels of sophistication; namely:

- **Level 1**: Appreciating the societal impact of scientific and technological change, and recognizing that science and technology are, to some extent, culturally determined.
- **Level 2**: Recognizing that decisions about scientific and technological development are taken in pursuit of particular interests, and that benefits accruing to some may be at the expense of others. Recognizing that scientific and technological development are inextricably linked with the distribution of wealth and power.

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5 This term is one of several in use to describe issues or potential problems stemming from interactions among fields of science and technology and societies (or, more likely, interest groups in them). ‘Socioscientific issues (SSI)’ are, more or less, synonymous with ‘STS’ or ‘STSE’ issues, the former referring to relationships among fields of science (S) and technology (T) and societies (S), while the latter also considers environments (E). Different authors tend to use different terms for approximately the same meaning.
- **Level 3**: Developing one’s own views and establishing one’s own underlying value positions.

- **Level 4**: Preparing for and taking action (p. 655).

There is evidence to suggest that where it occurs, education relating to SSI tends to concentrate on the first three levels above. Students are frequently asked to negotiate some contentious issues and attempt to defend their positions on them. Recent research suggests, however, that they are less likely to prepare for, or to take action to address SSIs (e.g., Lester et al., 2006). As Hodson (2003) says, “[i]t is almost always much easier to proclaim that one cares about an issue than to do something about it!” (p. 657; emphases added). Education in SSIs tends, in other words, to be an abstract and mostly individualized process — rather than one in which students reach out to communities near and far and act for change. It seems imperative that educators think of activism in a socially connected way, as a ‘giving’ process, promoting greater good. Such a perspective on self in relation to others is aligned with communitarianism social principles and social epistemology (Fuller, 2002); that is, that individuals are socially (historically and concurrently) constituted and, consequently, albeit not necessarily for altruistic reasons, need to act responsibly towards each other and environments (e.g., Code, 1987; Eiglad & Bookchin, 2007; Lehrer, 2001).

**Opportunities for STM education and research**

A suggestion from the assembled authors is that, as scholars, educators and researchers, we recognise activist orientated pedagogy and research as one among many legitimate alternatives. Our field needs to take seriously the question of how, why and where to engage in such approaches. It is our assertion that activism offers opportunities for rich, diverse pedagogies of experience, participation and empowerment in which students, teachers and researchers can, through knowing and acting, come together to name the world and explore and reshape their place in it. Education, even in the most variegated and imaginative forms, should not lose sight of this opportunity and the associated possibility of being part of a growing coalition with something important and significant to say about/for the future. With much care, such positioning, we believe, offers educators, researchers and administrators hopes of sustaining and enacting new visions of research and pedagogy by recovering desires of ‘making-a-difference’ through taking collective action on social and ecological concerns that they find meaningful. Such an embodiment of education and research stands in opposition to systems that perpetuate personal, social and ecological injustices and, instead, emphasize solidarity, democracy and responsibility to heal and celebrate relationships between people communities and life on Earth.

Elsewhere, we (Alsop & Bencze, 2009) have gathered expressions of activism in SMT education within three broad themes: **Disclosing** (exploring and making public practices in SMT); **Mobilizing** (mobilizing though education towards the common good); and **Celebrating** (highlighting and celebrating successes). These themes are evident in the following articles as well as articles in the online Project for Activist Science and Technology Education (PASTE), which (in part) formed the genesis of this Special Issue. As previously mentioned, to our knowledge, this is the first mainstream STM education journal with an activist agenda. As might be expected, the articles in this edition raise many questions for further study, debate and discussion. There is an open question of how manifestations of pedagogy that
follow social and environmental justice agendas should be different to pedagogies based on an ‘academic’ or ‘child centred’ agendas?

In some ways, the articles assembled in this journal do not seem that far removed from popular work in our fields. There has been a wealth of policies advocating, and scholarship studying, education for equity, social justice and environmental sustainability. Popular epistemic related research topics in our field include the nature of science, technology and mathematics, inquiry, design and argumentation (to mention just a few). Combining these two themes, it seems to be the next step to ask more normative questions such as: What should be the nature of Science Mathematics and Technology? What Science, Technology and Mathematics do we need? Or not need? And why? What relevant groups should be involved in making such decisions, how and why? Here, we share Brickhouse and Kittleson’s (2006) vision of education as a way of advancing the expertise that we need rather than that we presently have. In this issue, Lyn Carter (article #3), in the context of her critique of globalisation as it relates to science education, calls into question ‘learner-centred pedagogies’ — which, presumably, include inquiry-based learning approaches that have recently become ‘normalized’ in many jurisdictions. An allied point here is that such normative questions might be efficacious in troubling representations of knowledge and disciplines as ‘objects,’ reified and removed from our input and control, to explore more democratic visions and subjective relationships.

There are many other questions. Wolff-Michael Roth, in article #8, using Cultural Historical Activity Theory, draws a distinction between activism and activity; distinguishing between understanding and transforming the world. In this light, he explores roles for the individual as part of the collective in transformations envisaged by the WSÁNEĆ First Nations People. As Roth states, they “understand that they are part of a whole that exceeds any one of them, and that they are there to serve this whole (community, life) that transcends each individual” (p. xxx). At the same time, he highlights the place of Marxist materialist dialectics in issues and transformation. He suggests that “the category of activism always implies two irreducible dimensions: the material and the ideal” (p. xxx), which begs perpetual questions concerning ‘the good.’

Questions of ‘the good’ also are, apparently, on the minds of the activists highlighted in the cases articulated by Matthew Weinstein (article #7). Drawing on various and open-to-questioning expertise involving SMT, street medics engaged on political/economic protests, writings by the sick as they associate corporatism with health care; and human research subjects who ask challenging bioethical questions. From these cases, we see visions of possible futures for current students — although, in a better world, such challenges would be obsolete. Such stories are, generally, not the stuff of school science, mathematics and/or technology. Windows into these worlds, though, would be eye-opening for students. On this, he suggests that “no one is prepared to rewrite science and nature unless they have models and rehearsals of lives which ‘denaturalize’ the extant technoscientific world order” (p. xxx).

Articles in this issue by Angela Calabrese Barton, Indigo Esmonde and Beverly Caswell and Erin Sperling and Lawrence Bencze offer reflections on the distinctive educative opportunities that activism offers as both an identity and knowledge forming project. In her article, Barton importantly brings attention to the necessity of grounding considerations of

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6 This can usefully be extended to refer to technology and mathematics as well.
activism within daily practices in recognition that young people, teachers and researchers constantly make decisions — and might do so with sustainability for others and environments in mind. In this respect, we must escape the debilitating stereotypical imagery that surrounds activism as the ‘spectacle’ — imagery that we have little doubt will be reinforced by media coverage of the forthcoming G8/G20 summits. Collectively, these articles also help us rethink terms of democracy — as teachers, students and researchers become civic actors, developing political skills and making community connections.

Closely related, in Critical Pedagogy there have been sustained discussions of forms of resistance and distinctions drawn between expressions of ‘oppositional acts’ and ‘strategic resistance’ (actions in pursuit of a common good). There is much discussion that suggests opportunities for research and action on something that is strategic, personally and socially relevant can nurture collective forms of identity; helping people understand their connection to others who share their commitments, backgrounds, interests and passions. It can also help make social and ecological changes tangible; helping youth to make connections to social movements and understanding how equality, civil rights and environmental justice apply to their lives and daily contexts. In the context of STM education such discussions are evolving and these complex claims clearly need much greater attention. They raise a clutch of important questions including; in what ways might teachers mask their perspectives on SSIs? Or, to what extent should they do so? How much teacher-controlled ‘scaffolding’ of students’ expertise development and decision-making should occur? What should be the balance in schooling of student-led transformations of the world and representations of the world? What do liberal models of education mean in an era of climate change?

Leo Elshof, in article #4, brings attention to the unsaid, by disclosing the uncomfortable. Opinions will, of course, differ regarding the amount of attention that topics deserve in the curriculum and what should be our priorities as educators, researchers and administrators. As previously mentioned, there has been a noticeable shift in attention toward matters of concern, as opposed to matters of fact (to use Bruno Latour’s distinctions). Nevertheless, it is important to explore inattention as well as attention and while our practices have gravitated toward issues of social justice, environmental sustainability and, perhaps, to a lesser extent considerations of health, there are some topics that remain underexplored. We are still much more hesitant to explore commercial economic forces and the role that the military has in actively shaping research and knowledge. These are two areas that presently account for the vast majority of R&D funding. A Toronto-based physics teacher might feel a need to know more about the sound cannons and the cell phone blocking technology that s/he will be shortly facing.

Throughout these discussions, we have purposefully sought to comment on STM pedagogy and STM education research. It is our contention that partisan activist perspectives offer multiple opportunities for practice and research. They open up significant questions not only about educational practices but also about our own practices as researchers and the values and goals that we inscribe (and wish to inscribe) within our scholarly work. The point at which we leave this editorial is self-reflexive, in keeping with the open, partial perspectives that we associate with activism. The polity of STM education, our own institutions of research and their politics have largely escaped attention. We leave open the question of

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7 We are reminded of Paul Willis’ (1991) Hammertown lads and associated discussions of resistance by Henry Giroux (1996).
what activist research means in STM education as well as how and who should decide. We openly wonder if partisan enactments of research might unsettle some deep-seated desires of value-free, objective empirical inquiry? What are the natures of our own research? How do we decide what to focus our attention on? How should we read the preoccupations of our field in terms of neoliberal assumptions and values, or as democratic and republican ideals of active citizenship? What is the STM education research that we need?

Steve Alsop & Larry Bencze / Larry Bencze & Steve Alsop
Toronto.

References


