EDITORIAL
What STEM educations might we care for? Where, when, how and why?

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Responses
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This edition of JASTE is concerned with STEM in a variety of educational contexts and social relationships. In this regard, the assembled authors join with educators from around the world seeking better ways of understanding and shaping educational practices in response to what is fast becoming the dominant slogan and rallying call of contemporary education reforms.

As the authors in this issue eloquently argue, educational reforms are under the increasing influence of neoliberalism. Whilst neoliberalism is widely lamented as a dominant ideology, it resists conclusive and rigid formal definitions. Indeed, a uniform definition of neoliberalism is lacking, and in its place various differing characterizations of neoliberalism are emerging in the literature (e.g. Tabb 2002; Harvey, 2005 & Mirowski, 2009). To a certain extent, the concept has become so pervasive that it remains unclear, and this may create a bit of confusion rather than insight, as to what exactly neoliberalism is, how and where it operates, and which forms can it take. Some authors reiterate the need for thinking about neoliberalism both in the plural and as ongoing projects with different consequences and degrees of success in their implementation (see Peck & Tickell, 2002 & Pleweh, 2009). Kingfisher and Maskovsky (2008), for instance, even go as far as to suggest that the concept of neoliberalism should be abolished when used in abstract, and instead scholars should focus on particular “instabilities, partialities, and articulations”.

Yet despite the volatility of the concept, the introduction of market driven reforms aimed at transforming the way we live and relate to others is demonstrably ever present. The link between education and various structural expressions of neoliberalism has been well established (e.g. Hursh, 2007; Hantzoupouos et al., 2014 & Brown et al., 2016). STEM, and other variations of the acronym (such as STEAM), can provide a vehicle for these reforms, which in general terms, involve the reorganization of education policies and curriculum choices towards the demands of the market. Market competitiveness through increasing efficiency has taken on new meaning and intensity fueled by international economies of performance, constituted and driven by standardized assessments, including local, national and international tests.

STEM is everywhere at the moment, providing easy answers to complex questions. What should children know for our new knowledge economy? How should we raise school achievements to be nationally globally competitive? How can we plug leaky pipelines resulting in harmful shortages of technically skilled personnel? How can we engage learners more effectively? How might we address equity and inequality in schooling? How might we efficiently integrate curriculum areas? How might we connect schools more productively with local communities? The answer is ‘STEM’. The associated questions and complexities, however, are rarely as clear as they might appear at first sight.
The point is that STEM education seems to have a mind all of its own, often driven by desires of modernity and progress. The need to enhance workforce development, to build greater economic prosperity, strengthen national security, and to have tougher immigration practices have become so entwined with national identity and technological progress that they now seem unquestionable. Who could possibly argue against such things? In the current era of anxiety and fear about an uncertain future and loss of a competitive advantage, STEM has become a favored road to redemption. Nevertheless, within the swirling self-referential logic and self-congratulatory reverence, there is now growing reflexivity. What might we learn from our existing and historical practices? At this particular moment in history, how ought we speak of and respond to STEM? What STEMs do we really need in education? What do we not? What STEMs might we care for within our classrooms? When, where, how and why? It is these important questions that underpin the papers that follow. The assembled arguments offer a grounded, reflexively driven analysis of STEM pedagogies predominately rooted in political economy and enacted within particular contemporary social and ecological conditions. The education that the authors seek is profoundly engaged with the prospects and hopes of more openly situated relational-practices.

In the first article, Lyn Carter turns her attention to Neoliberalism and STEM Education, addressing the relation between neoliberalism and STEM, interrogating the “knowledge-as-commerce” basis of this educational model through the concept of nomadology (Deleuze and Guattary, 1987). In particular, Carter explores the adoption of the Global Education Reform Movement (GERM), which is related to the promotion of STEM education in Australia. For Carter, this reform encourages a reductive approach to education.

In the article, Battle of the Bands: Toxic Dust, Active Citizenship, and Science Education, Larry Bencze and Larry Pouliot, take us to a community close to the Port of Québec City to examine a socio-environmental conflict about dust pollution. The authors outline a localized educational intervention that aims to develop a sense of activism and action rooted in communities where citizens can fully engage with “socio-political controversies” and promote the “wellbeing of individuals, societies, and environments”. Using Foucault’s concept of dispositif, they provide an example with a community affected by toxic metal dust pollution.

In Recovering Beauty Through STEM Science Education: A Letter to a Junior Colleague, David Blades argues that the incorporation of aesthetic features into the STEM curriculum overcomes the narrowness associated with the neoliberal character of this acronym. Based on an historical overview of different acronyms that have been used in education since the Cold War, Blades draws two main conclusions: first, acronyms, as overarching principles, matter, as they indicate “conceptual organizers” for education in particular contexts. However, second, they are flexible enough and can be adapted to the circumstances of teachers and schools. Blades uses these conclusions to call for a reinterpretation of the STEM areas so that they can take aesthetic questions seriously. This would partially transform the STEM curriculum, expanding its educational scope to address social and ecological concerns that might challenge neoliberal agendas.

In the next article, STEMification of Education, Ajay Sharma borrows the term “zombie categories” from Ulrich Beck (2002) to refer to STEM initiatives because they come back periodically in different forms and different names, despite its adverse effects in the public education system. A dominant but inconsistent discourse about the gap between the demand and supply of skills for the private sector legitimates the latest package of reforms in education. Sharma connects this intervention to failed attempts in the past to shift public education towards a more neoliberal system of education. Finally, Sharma encourages forms of resistance to neoliberal policies in education that are based on collaboration between activist groups.

It is precisely the notion of collaboration that forms the basis of the next article in this issue, Promoting Youth Empowerment and Social Change In/Through School Science. Sara Tolbert, Nicole Snook, Corey Knox, and Inyene Udoinwang focus is on the collaborative project, Community Engagement and Youth Leadership through
Science Education, a network of activists, teachers, and students, among others, who inspire and maintain a justice-oriented approach to science pedagogy. In the context of this project, the authors engage in thinking about social and political empowerment through a conceptual framework by Schindel Dimick. Despite some difficulties associated with the undertaking of the project, the authors show that developing empathy and solidarity is productive to promote justice in the school and wider community.

Mathew Weinstein in an article entitled *Critiquing and Transcending STEM* connects STEM education to a form of neoliberal enterprise promoted through the Next Generation Science Standards in the US. Using mainly the prolific work by Mirowski on neoliberalism (2011), Weinstein addresses the major problems involved with treating education as a market. These include the marginalization of some kinds of knowledge, the departure from democratic strategies through an entrepreneurial logic, and the erosion of social solidarity, among others. This raises questions like the following: How can people involved in education counteract the effects of neoliberalism? Rather than simply developing alternative curriculums, Weinstein encourages collective actions and forms of resistance that address the root causes of the problem to achieve a post-neoliberal position for education.

In his influential book *The Post Modern Condition* (1984), Lyotard discusses the legitimation of knowledge in the “highly developed societies” to account for the end of “grand narratives”, which historically characterize modernity as a universal project. Zouda in an article entitled, *Deconstructing STEM: A Reading Through The Postmodern Condition*, builds on these notions of knowledge to analyze STEM education in the postmodern society. He suggests that the focus of STEM education on performativity, which uses interdisciplinarity as a standard, and the encouragement of competition, lead to a process of internal differentiation that undermines education, and all this despite the potential benefits that could be obtained from interdisciplinary approaches. Zouda concludes by encouraging educational communities to promote alternative ways that redress the competitive character of STEM education.

The seven articles in this issue use a variety of methods, ontological positions, and levels of analysis of education to show that STEM is far from being a uniform and coherent approach to education independent of the context of application. When confronted with the rich and diverse experiences of schools and wider communities, there are a multiplicity of ways of challenging narrow educational agendas and promoting alternative ways of learning, and hence living. Yes, the influence of STEM is undeniable, but as this issue shows us, a particular manifestation of STEM as no holds barred free-market competitiveness is preventable, if members of schools and communities work closely together. The education response to STEM that we want is far from idealistic, indeed it is found in every classroom, within complex and caring human relationships and encounters between students and teachers, within pedagogical invitations to encounter and embrace the world with increasing understanding and empathy. Admittedly at times, it seems that our educational futures have succumbed to a politics of fear, marked, numbered and thereby ordered by external metrics. In contrast, the education that we celebrate in this issue is an expression and celebration of the compassion, promises, hopes and fragilities of humanities cultures. Market driven reforms might make sense to those loud voices, far removed from actual classroom practices. As Theodore Porter (1995) persuasively argues, measurements from a distance, appeal, in part, because they offer a bird’s eye view of social jurisdictions with a false appearance of being fair, impersonal and neutral. In reality, these measurements and the associated free market to which they serve, are political constructions. Far from being neutral, they often favor those in power. But when experienced up close, as every successful teacher and student really knows, education is so much more than a numbers game of maximizing efficiencies and counting winners and losers. Indeed, all around the world teachers and learners are succeeding in ways that are inspiring and far reaching.
References