Science education during times of crisis: calling for reflections, responses, and forward thinking from the CSSE community

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We are living at a momentous time in history, faced with a pandemic that has changed life in much of the world, and significantly altered how we interact with each other in our homes, workplaces and communities. The rapid spread of coronavirus has already had immense social, economic, and health consequences, while highlighting and reinforcing disparities in social systems internationally. There have been abrupt, drastic and unplanned changes to our educational systems, impacting teaching and learning processes in countless ways, and with significant effects on learners and teachers. As our collective lives on many campuses and classrooms globally have come to abrupt halts, we find ourselves faced with new ways of interacting, new ways of being. Education writ large has suddenly become centered around teaching remotely and learning and working from home, with schools and universities closed in much of the world, and teachers, students and caregivers needing to rapidly adapt to remote learning formats and new ways of working together. At the time of this writing, over 90% of the world's student population are expected to be impacted by nationwide school closures, with UNESCO predicting that more than 1.5 billion learners will be affected (UNESCO 2020).

The current pandemic has hit a world already struggling with environmental degradation and biodiversity challenges. The relationship between climate change, hunger and malnutrition, and health, as well as the impact on the world's most vulnerable peoples, is not to be underestimated. A recent UN commissioned joint report from the WHO, UNICEF and The Lancet, *A future for the world's children?* (2020) states that "climate change, ecological degradation, migrating populations, conflict, pervasive inequalities and predatory commercial practices threaten the health and future of children in every country". Released on February 18, 2020, 3 weeks before COVID-19 was first declared a pandemic by the WHO, the report concludes with the sobering analysis that "No single country provides the conditions to both support children to live healthy lives today and provide an environment fit for their future". This conclusion becomes further complicated, and dire, when taking the complexities of the current pandemic into consideration.

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Cultural Studies of Science Education during a time of crisis

The journal Cultural Studies of Science Education (CSSE) was created 15 years ago to serve as a venue for disseminating cutting edge scholarship on science education through sociocultural lenses. The journal was founded with an aim of establishing and supporting new forms of scholarly community, and to “foreground multiple diverse perspectives on the most significant issues in the field and assume a leadership role in identifying and giving shape to the issues that define scholarship in science education” (Roth and Tobin 2006, p. 1). Currently co-edited by Catherine Milne and myself, CSSE has grown to be an international community over the past 15 years, with a diverse authorship, committed editorial board, motivated reviewers, and a wide global reach of readership.

Aligned with the aim of serving as a venue for scholarly innovation and dialogue, and in response to the current global circumstances, we will devote parts of the upcoming issues of the journal to papers dealing with science education during these times of uncertainty, and we call on the CSSE community to generate scholarly dialogue and reflection focused on the overarching question: *How can the Cultural Studies of Science Education community contribute to understanding, responding to, and re-envisioning this era of pandemic?*

There are many questions that emerge when reflecting on the role of our community at this time, including: What is the role of science education in a time of a global crisis? How can science education contribute new knowledge in finding ways forward that are equitable, and prioritize solutions focused on collaboration and social justice? How will the pandemic change the way we think about issues of education including what learning looks like in an era of remote instruction? Will the pandemic further highlight the inequities that undermine the quality of education available to all? These are some of the questions Cath and I have been grappling with, and we hope to engage the CSSE community in reflecting on how the cultural studies of science education can contribute to new understandings relevant to the current global circumstances. Together with Jennifer Adams, Joseph Henderson, and David Long, we will soon be issuing the complete details of a call for papers, in which we encourage the CSSE community to submit articles addressing the COVID-19 pandemic.

Our social and political systems are under extreme stress, and inequalities are even more glaring, “This crisis is exposing the extreme fissures in our society and the deep and abiding obligation we have to put things right” (Nasir and Bang, 2020). We have changed in fundamental ways, and will never be the same. Global closures of educational institutions present formidable challenges to millions of children, teachers, and parents, and the choices that we make now will likely resonate long into the future. Science education is an important part of a responding to the COVID-19 pandemic and to global climate change, and we believe that the cultural studies of science education can provide critical lenses on ways to move forward in solidarity.

Cultural studies of science education and innovative scholarship

In the first editorial in 2006, founding editors Wolff-Michael Roth and Kenneth Tobin elaborated CSSE’s unique focus on “scholarly articles that employ social and cultural perspectives as foundations for research and other scholarly activities in science education and studies of science” (Roth and Tobin 2006, p. 1). We take pride in examining science

education as a cultural, cross-age, cross-class, and cross-disciplinary phenomenon, and hope to be a home for innovation, while seeking to emphasize issues of equity and social justice. The quarterly issues of CSSE typically present publications immersed in cultural studies perspectives, and with a diversity of foci regarding science education. The papers in this current issue illustrate the wide range of work typically evident across an issue and annual volume, each providing new lenses on science education research and practice. The articles published in this issue, the 2nd of our 15th volume, have been in development before a global pandemic started to impose itself on our lives, yet the underlying focus on working toward contextually relevant practices with teachers and students has clear implications to current circumstances. The individual papers examine diverse ways to understand teaching and learning science, in particular emphasizing the relevance of identities and positionings coupled with the related roles of methodologies and context, and taken as a whole, this issue underscores the necessity of working toward equitable access for science. A critical point for reflection emerges in my own reading of these papers collectively, which is that of the importance of supporting teachers and students in drawing on, and extending, the plethora of resources they already bring to teaching and learning settings. In sum, the papers in this issue serve to make strong contributions to understanding the complexities of teaching and learning science in contextually relevant ways while presenting varied considerations for working toward equitable and transformative practices for science education.

In *Science identity as a landscape of becoming: rethinking recognition and emotions through an intersectionality lens*, Lucy Avraamidou forwards intersectionality as an important methodological perspective as she highlights the value of framing science identity as a landscape of becoming. Emphasizing the emotionality of science identity, this contribution underscores the dialectical relationship between emotions and (mis)recognition. CSSE views manuscripts as the start of a conversation, and thus many of our papers are published together with Forum papers, which respond to and extend the points in the initial contribution. An example of this approach to engaging in the scholarly process is Allison Gonsalves' forum paper, in which she builds upon Avraamidou's work to operationalize intersectionality theory analytically, elaborating how other researchers have made this possible and drawing conclusions regarding the importance of time and space in recognition research. The emphasis on emotions in this paper set is also explored in James Davis and Alberto Bellocchi's manuscript, *Intensity of emotional energy in situated cultural practices of science education*, in which the authors discuss the importance of paying attention to the role of emotional energy in science education settings, and elaborate the co-relatedness between the emotional energy of a classroom with students' emergent understandings of science ideas. Davis and Bellocchi's paper has a response by Reza Feyzi Behnagh, published in issue 1 of volume 15. In this forum paper, Behnagh extends the perspectives on emotions by exploring different methods of measuring emotions, and raising points for consideration by science education researchers interested in this area of work.

The nuances of becoming and being a teacher continue as a focal point of a paper set around the contribution by Augusto Macalalag Jr., Joseph Johnson and Michelle Lai, *How do we do this: Learning how to teach socio-scientific issues*. The authors explore how teachers navigated curriculum to incorporate SSI into their teaching practices, and tease-apart shifts in teachers' perceptions related to field experiences designed to support the teaching of SSI. Their work highlights the complexities of learning to teach socio-scientific issues, and two forum papers underscore this complexity further. Darren Hoeg discusses SSIs as related to environmental ethics in his response paper, foregrounding tensions in socio-scientific issues as related to developing the oil sands in Canada and connecting these

to the work of Macalalag Jr., Johnson and Lai. Jina Chang and Jisun Park raise questions about what, and how, teachers should learn as regards socio-scientific issues as they introduce the concept of SSI-PCK, and examine connections between this framework and the research of Macalag Jr., Johnson and Lai.

The complexities of learning to teach science become further evident through Kristina Andersson, Annica Gullberg, Anna Danielsson, Kathryn Scantlebury, and Anita Hussénius's paper, *Chafing borderlands: obstacles for science teaching and learning in preschool teacher education*. Focusing on early childhood teachers participating in science education courses, this work explore tensions that arise between two different cultures, preschool culture and university science culture, tensions which can create what the authors aptly refer to as "chafing" at their borders. The authors unpack these perspectives on borderlands through the analysis of pre-service teachers' science education experiences, as they focus on how the different cultures, and boundary lines between the cultures, affect students' perceptions and expectations for instruction. Approaches for supporting pre-service teachers as they learn to teach science are also raised and examined in Sheron Mark, Lateefah Id-Deen and Shelley Thomas' paper, *Getting to the root of the matter: pre-service teachers' experiences and positionalities with learning to teach in culturally diverse contexts* in which they use critical discourse analysis to examine pre-service teachers' participation and positionalities regarding learning to teach and raise implications for teacher education programs and school-based administration, in particular, as regards beliefs which may have an influence on teaching and learning.

Another significant consideration for science teaching and learning addressed in several papers in this issue is the role of languages for science learning and teaching. Peter Licona and Gregory Kelly's contribution, *Translanguaging in a middle school science classroom: constructing scientific arguments in English and Spanish*, examines the ways in which a bilingual teacher translanguaged and considers how engaging in scientific practices was constructed by the teacher and her emergent bilingual students across English and Spanish language practices. Philip Clarkson builds upon their work to set it against a broader context in a reflective forum discussion. Extending upon key points from the original paper, Clarkson's response emphasizes the necessity of studying the language context of teaching/learning science. The integral role of language and science is also the focus of Lauren Swanson, Emily Kang, and Clara Bauler's paper, *Revealing a bilingual science teacher's dynamic views and practice about science and language teaching through dialogic reflections*, in which they posit that a new curriculum, coupled with on-going dialogue and co-teaching with one of the authors, mediated a teacher's emerging abilities to think and act in different ways.

As this issue of CSSE shows, the role and nuances of languages and identities for science teaching and learning are two major considerations for the work of researchers using cultural studies lenses. A further integral consideration for researchers using sociocultural lenses is that of context, as Alejandro Gallard Martínez, Wesley Pitts, Katie Milton Brkich, and S. Lizette Ramos de Robles elaborate in *How does one recognize contextual mitigating factors (CMFs) as a basis to understand and arrive at better approaches to research designs?* Their work highlights the value of recognizing CMFs in the design of research, and they stress that how context is positioned and how phenomena are studied in research are situated, and conclude by drawing attention to the potential impact of CMF analysis on evaluating research designs. Serving as the start of a three-manuscript paper set, this contribution is responded to and further elaborated in two forum papers, one by Sonya Martin and Da Yeon Kang, and one by myself and Sara Wilmes. In their response, Martin and Kang consider how CMF analysis can help researchers be more critical about their ontological–epistemological–axiological

stance and how this stance informs their understandings. Relatedly, Wilmes and I also build upon the work of Gallard Martínez et al., as we reflect upon different elements one might consider regarding the role of context for working toward equitable, responsive practices and draw upon our own research projects to discuss CMFs related to issues of equity in teaching science with culturally and linguistically diverse students.

The methodological focus continues in the final paper set of this issue, beginning with Vanessa Anthony-Stevens and Sammy Matsaw Jr.'s exploration of the integration of decolonizing methodologies in the preparation of STEM researchers, *The productive uncertainty of indigenous and decolonizing methodologies in the preparation of interdisciplinary STEM researchers*, in which the authors examine STEM student reactions to including Indigenous ways of knowing into research methodologies courses. This issue closes with Elizabeth McKinley's response paper, in which she explores tensions in doing Indigenous work in the academy and argues for framing the inclusion of Indigenous knowledge at a systematic level beyond the classroom, to be evident at the institutional and individual levels as well.

Looking forward

In announcing the first issue of CSSE, Roth and Tobin (2006) wrote "the journal will foreground multiple diverse perspectives on the most significant issues in the field and assume a leadership role in identifying and giving shape to the issues that define scholarship in science education". The era in which we are living has significant issues and challenges that will impact the field, and society, in profound ways. In working towards the goal of giving shape to defining scholarship in the field, we invite potential authors to think broadly about the role of the science education community at a time of crisis, both within and beyond COVID-19. We hope to receive submissions from a range of scholars, contexts, and perspectives, and possible topics could include: Issues of justice and equity in science and science education during times of crises, The social and cultural production of mis/trust in science, Political ideologies, science, and conflicts between individual and social goods, Social, conceptual, ethical, epistemological issues within the field of science education, Climate change, pandemics and reflections on the role of science education, Critical analyses of policies and institutions that mediate progress, among many others possible topics and foci. I hope that CSSE readers and contributing authors are as inspired as we are about this upcoming special initiative, and that we can come together in scholarly community, to focus on finding solutions and reimagining a new future during this era of COVID-19. "Returning to normal" is not possible. There is a new normal, one that is shifting and changing, shrouded in uncertainties. We must begin to look forward despite the uncertain future, to think about what lies ahead, and envision what new futures could look like. Hopefully, we can come together and try to find new ways to reflect upon inequitable structures that have been normalized and move toward transforming our contexts to be more just, equitable, and compassionate.

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