



# A Reflection on Reimagining Education: Inspiration, Innovation and Thriving in a Changing World

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**Abstract** In this commentary, I reflect on the state of science and science education in a changing world. Drawing on my experiences and as someone who worked with CJSTME at the inception of the journal, to my return in the role of science editor, and on a UNESCO report – I comment on the inequities present in science education.

**Résumé** Dans ce commentaire, je réfléchis sur l'état actuel de la science ainsi que sur celui de son enseignement dans un monde en évolution. Puisant dans mon expérience en enseignement des STEM et des sciences, et en tant que personne qui a travaillé avec la RCESMT aux tout premiers débuts de la revue, jusqu'à mon retour dans le rôle de rédacteur en chef scientifique, je livre mon opinion sur les iniquités dans l'enseignement de la science dans l'optique du rapport de l'UNESCO sur *Les futurs de l'éducation*.

**Keywords** Science education · Science communication · Science equity · Public science

At this year's 50th annual conference of the Canadian Society for the Study of Education, I was the keynote speaker for the Science Education Research Group. As I conducted research for my presentation, I reflected on how the world has changed, largely due to the COVID-19 pandemic. In education, the pandemic necessitated school closures globally, with around 1.7 billion students impacted in 190 countries in 2020 and 2021 (Barron Rodriguez et al., 2021). This resulted in an abrupt move to emergency remote teaching. The pandemic has been a seismic event for education across the globe, spotlighting gaps in resources, funding, and technology, as well as existing racial and economic disparities. In 2019, UNESCO established the

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International Commission on the Futures of Education to reimagine how knowledge and learning can shape the future of humanity and the planet. The Commission's 2020 report, *Education in a post-COVID world: Nine ideas for public action*, outlined key areas for public action including a commitment to education as a common good; the right to education; the importance of the teaching profession and teacher collaboration; student, youth and children's participation and rights; protecting social spaces of the school; free and open source technologies; scientific literacy with a strong purpose; domestic and international funding of public education; and global solidarity against inequality (International Commission on the Futures of Education, 2020).

One year later, the Commission released *Reimagining our futures together: A new social contract for education* (UNESCO, 2021) in which they expanded and refined the nine ideas into a 186-page three-part report: (1) Between past promises and uncertain futures; (2) Renewing education; and (3) Catalyzing a new social contract for education. The first part of the report is dedicated to equitable educational futures, and disruptions and emerging transformations, with an emphasis on four key areas that overlap: environmental education, digital literacy, governance systems and the world of work. The second part of the report focuses on pedagogies of cooperation and solidarity, curricula, the transformative work of teachers, safeguarding and transforming schools, and education across different time and spaces. In the final section, the Commission calls for research and innovation and for global solidarity and international cooperation. Each part of the report, and accompanying sections provide visions, principles, and proposals that the Commission cautions should not be interpreted as a manual nor a blueprint for education.

The aforementioned ideas and themes in the report are not new to education, as over the years special issues of journals, including the *Canadian Journal of Science, Mathematics and Technology Education*, have been dedicated to some of these themes (e.g. nature of science, informal learning in science, environmental education, equitable access in mathematics, activism, indigenous science education, education for citizenship, anti-black racism in STEM, and so on). What is evident in the report is the Commission's call for transforming research with a focus on themes that overlap, as well as those that were highlighted during the pandemic. It is noteworthy to mention their emphasis on equity and digital literacies and technologies, noting that "digital literacy and access across the disciplines are a basic right in the twenty-first century; without them it is increasingly difficult to participate civically and economically" (p. 34). The Commission acknowledged inequities related to connectivity and access to digital technologies and stressed closing the digital divide as a first order of business.

The pandemic also brought to light those individuals who find some of the 'accepted' scientific knowledge erroneous, as well as the circulation of mistruths across different media, resulting in a call from the Commission for "a strong and highly reflexive scientific literacy" (UNESCO, 2021). This is a rather interesting call given that science curriculum documents promise "a high degree of scientific literacy" as an achievement of all graduates and makes one query if we are achieving the purpose of science education. This is not unfamiliar territory as over 20 years ago, in the inaugural issue of the *Canadian Journal of Science, Mathematics and Technology Education (CJSMTE)*, Wellington (2001) reminded us that the purpose of science education had provoked continuing debate over the decades. He highlighted from past discussions two key aims of science education — to develop scientifically literate citizens and to prepare a minority for science-based careers. These are conflicting, as he pointed out in his discussion. He urged us in 2001 to go back to the drawing board as "... 80-year tinkering, re-presenting, and re-packing of a curriculum for a minority to meet the needs of all has clearly not succeeded" (p. 25). Today, his observation still holds true. I concur that we must return to the drawing board in our post-COVID world, of course without the tinkerers, or perhaps just a few. I suggest that in our return to the drawing board, now more than ever we must pay close attention to the personal and societal contexts of science and ensure that *relevance* is at the forefront of our discussions. During the pandemic, phrases like 'flattening the curve' and 'social distancing' became regular adages in the world's vocabulary. Why should anyone wear a mask? Unfortunately, the majority of the public are ill-equipped in terms of their scientific literacy acumen, and subsequently their understanding of the implications and their ability

to make sound medical decisions about COVID-19 was limited and limiting. Perhaps I am being naïve to believe that more scientific literacy is the answer. Nevertheless, these are blatant reminders that we need to revisit ‘how’ and ‘what’ we teach. I am not suggesting that we dismantle our practices and join the post-COVID bandwagon. I am, however, suggesting that we capitalize on approaches already in our arsenal for developing a strong scientific literacy.

COVID-19 present numerous affordances and implications for education across the disciplines. In science/STEM education, opportunities for developing a strong scientific literacy include:

- (i) Authentically integrating the history, philosophy and sociology of science in science curriculum (Reiss, 2020).
- (ii) Explicitly incorporating the nature of science when discussing societal problems, such as pandemics (García-Carmona, 2021).
- (iii) Demonstrating the potential and value of interdisciplinary STEM education for understanding and tackling real world problems.
- (iv) Focusing on the interrelatedness of science, economics, and politics and how these factor into decision-making about public health.
- (v) Highlighting human practices and consequences, socio-scientific issues and accompanying impacts on society.

A common theme in the report is that of inequities, with the Commission reminding us that “Today’s gaps in access, participation and outcomes are based on yesterday’s exclusions and oppressions” (p. 20) and urging us towards more equitable educational futures. The pandemic posed unparalleled challenges and magnified the pre-existing inequalities in every aspect of society, including longstanding disparities in healthcare, education, and the workforce, to name a few. Concurrently, the targeted focus on Equity, Diversity and Inclusion (EDI) has permeated every sector, including education. EDI statements and strategies are explicitly highlighted on websites of school boards, educational institutions, and so on; however, exactly how these are/will be enacted remains to be seen. How can we promote equity in science education? The National Research Council [NRC] Framework (2012) noted that “Equity in science education requires that all students are provided with equitable opportunities to learn science and become engaged in science and engineering practices .... the issue of connecting to students’ interests and experiences is particularly important for broadening participation in science” (p. 28). The aforementioned is in opposition to the second aim of science education — to prepare a minority for science-based careers (Wellington, 2001). What is to become of the majority of learners if we are preparing a minority for careers in science? It is not surprising that in science/STEM, mathematics, engineering and computer science, marginalized communities continue to be excluded by a combination of social, economic, cultural, and political factors (McGee, 2020; Nxumalo & Gitari, 2021), resulting in unattainable educational achievement and career aspirations in these fields. This has a trickle-down effect on quality of living and other factors affecting the individual, families, and communities. If we are truly committed to equity in science/STEM education, perhaps the focus should be on preparing minority groups for science-based careers.

In the inaugural issue of *CJSMTE*, Jenkins (2001) discussed the purpose and scope of science education research and provided opinions of strengths and weakness of science education as a field of research. Jenkins noted that it should “... recognize, understand, frame and address problems that deserve attention, rather than provide unequivocal answers concerned with such matters as pedagogy, and standards, or teacher quality” (p.11). In discussing a comprehensive overview of the *International Handbook of Science Education*, Jenkins shared a noteworthy comment of Malcolm (1999) who, after reading the *Handbook*, concluded that “if science education research is to play

its proper role in leading innovation internationally, it needs to think outside the square. It is time.” (Malcolm, 1999, p. 139, as cited in Jenkins, 2001). These critiques and opinions are not specific to science/STEM education and transcend a number of disciplines that are defined by their early history. Nonetheless, the ideas and sentiments prevail and resonate with the Commission’s call for transformative research in a post-COVID world.

In closing, I have to say that after reading UNESCO’s reports, I reflected on the title of my keynote address — *Reimagining education: Inspiration, innovation and thriving in a changing world*. The visions, proposals and principles laid out in the reports were inspiring. Nevertheless, I feel that ‘thriving’ is attainable, but uncertainty around the goals of education looms. One thing I am sure of — our world is changing. But I digress. All levels of education are grappling with fallout from the pandemic and will continue to do so for years to come. Even though it will take collective effort to translate and contextualize the visions and proposals outlined by the Commission to achieve significant transformation in education, at the moment it feels like “nailing jelly to the wall”. It is time to return to the drawing board!

## Declarations

**Conflict of Interest** The author declares no competing interests.

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