

LETTER FROM THE INVITED CO-EDITORS

In the ever-evolving landscape of education, STEM (Science, Technology, Engineering, and Mathematics) and STEAM (Science, Technology, Engineering, Arts, and Mathematics) approaches have emerged as pivotal paradigms, catalyzing interdisciplinary and cross-disciplinary learning, fostering critical thinking, and nurturing problem-solving skills. These methodologies have garnered substantial recognition within research and pedagogical practices, facilitating diverse conceptions that blend the realms of art, technology, science, and mathematics.

Contemplating the conventional Eurocentric or Western scientific focus in school science (Aikenhead & Elliot, 2010), it is evident that multiple ways of knowing and being have been inadequately represented. For over two decades, researchers and educators have grappled with the challenge of introducing alternative knowledge systems into a predominantly Western and Eurocentric educational structure (Higgins, 2014).

In response to these challenges, the Canadian educational system has shown a burgeoning interest in centralizing Indigenous perspectives and dismantling Eurocentric structures that often mold science education. This involves concerted efforts in research, professional development, and teaching practices to create inclusive science spaces that respect diverse worldviews while countering systemic barriers to equitable science education (Smith, Avraamidou, & Adams, 2022). For the first time in SFU Ed Review's history, this special issue disrupts traditional approaches to sharing work with the community by not only inviting participation and contributions from local and national science educators, but to open teaching science from different disciplines. More importantly, the editors of this special issue invited Herbert Shane Hartman, an Indigenous author and artist who is a member of the Beaver or Lhts'umusuyoo Clan from the Nak'azdli Whut'en First Nation located near Fort St. James, British Columbia, Canada, in conversation about the importance of language and knowledge preservation and its role in education. We are honoured to feature his original artwork, titled, *New Day* on the cover.

Shane's deep connection and commitment to his community and culture is reflected in his work and art. Shane is a self-taught artist working with simple minimalist style to convey the feelings of his artwork. Shane predominantly works with gouache and paper for his paintings, and with an iPad and Procreate for his digital pieces. As an artist Shane enjoys finding new ideas for artwork and feels that starting a new artwork is a great way to start a new day. Shane has also completed his Master's Degree in Natural Resources and Environmental Studies. On behalf of the journal and the Simon Fraser University community, we are honoured for Shane to share an original piece of artwork for the journal's cover. We encourage each reader to begin by reading the meaning behind Shane's art to truly understand the connections between each story.

This special issue seeks to explore and disseminate scholarly insights and practical knowledge across a spectrum of domains that are instrumental in shaping the future of STEM/STEAM education. This issue is divided into sections that spotlights STEM/STEAM educator voices from academia, community, students and educators. Authors have been encouraged to decenter expectations of academic writing and instead, to write from a place of heart, lived experiences, and stories that speak true to their everyday living, teaching, and learning. Moreso, this issue is divided into sections to capture the diversity of voices and contributions to the science education field. The sections are:

Theoretical and Conceptual Paradigms: This section delves into the theoretical frameworks and conceptual models that challenge traditional disciplinary boundaries. These frameworks are pivotal in the promotion of integrated STEM/STEAM teaching practices, which are at the forefront of educational innovation. In the anchor article, **Getting back to the real world: creative approaches to science literacy, problem solving and cultural inquiry**, Zandvliet discusses how STEM/STEAM frameworks dominate science education discussions, often with Eurocentric focus. STEM is primarily used in education policies to enhance science and technology competitiveness, with gaps in representation. This approach can reinforce hegemonic beliefs and overlook social and environmental issues. This paper suggests reframing science education around biocultural diversity, Two-Eyed seeing, and guided inquiry, fostering interdisciplinary practices centered on student and community needs, promoting creative science literacy, problem solving, and cultural inquiry. As we move beyond geographical boundaries on STEM education, Ogunlade, a professor at the University of Science Education and Technology Ikere in Nigeria discusses the importance of incorporating STEM/STEAM in early childhood education in an African context. In her article, **A Novel Pedagogical tool for childhood education in STEM and STEAM towards Achieving Sustainable Development Goals in Africa**, critically reviews early childhood education in Africa, examining its impact, benefits, challenges, and potential solutions. It analyzes theoretical frameworks, pedagogical tools, and practical experiences, including non-formal and community-linked STEM and STEAM approaches in Ekiti State, Nigeria. The study highlights the significant role of culture and environmental influence on learning. In the article **Steam and English for Specific Purposes: Online Courses for Brazilian Students in Technology**, Nunes and Barcelos invite us to question our understanding of informal English courses, particularly ESP ones, which, according to them, should be designed by an interdisciplinary group of professionals, such as language teachers and specialists in the area, in order to show a meaningful learning experience. In this way, this text aimed to analyze three informal online English courses designed for Brazilian students/professionals in technology considering the ESP and STEAM approaches and compare them with university learners' needs.

Community-based Science Education Research: This section spotlights personal narratives from non-formal educators who implement programs in science museums and similar environments. These narratives offer insights into real-world experiences. Additionally, innovative pedagogical approaches tailored for non-formal STEM/STEAM education prioritize hands-on learning, inquiry-based methods, and interactive experiences. Moreover, collaborative efforts and partnerships between science museums, educational institutions, and the broader community are instrumental in enhancing STEM/STEAM learning opportunities, making education more accessible and impactful. In **Science in Informal Learning Spaces: Tinkering Space at Science World**, Lee shares her lived teaching experience in tinkering spaces. She further highlights that establishing tinkering spaces in informal learning settings necessitates research, testing, prototyping, and evaluation. The design and programming are often iterative and time-consuming. A science museum like Science World, for example, employs a collaborative design process to create tinkering spaces. The Tinkering Space's creation prioritizes the visitor's experience, resulting in a thoughtful and well-designed environment. A group of ten environmental educators from the Vancouver Botanical Gardens Association is actively involved in community-based STEAM education.

In **Fostering a Lifelong Love of Plants: Educator Stories from a Botanical Garden**, Martin et al., share their experiences in connecting people to the plants at VanDusen Botanical Garden and Bloedel Conservatory, situated on the ancestral lands of the x^wməθkwəyəm (Musqueam), Skwxwú7mesh (Squamish), and Səlílwətaʔ/Selilwitulh (Tsleil-Waututh) Nations. Their experiences collectively emphasize the importance of nature in STEAM education. Their narrative illustrates that successful STEAM education thrives through collaborative efforts, embracing new educational opportunities, place-based experiential learning, and the inclusion of diverse perspectives, recognizing the impact of personal experiences on worldviews, and fostering a love for the natural world. In **History Teaching in a Museological Space: an Experience at the Rio Grande do Sul Memorial, Brazil**, Stelmach explored the narrative of the mediated educational action on the itinerant exhibition “Monuments and Art: the history of the city at risk”, which exposed a series of monuments and public statues taken from the streets of Porto Alegre. Thus, this paper aimed to discuss issues concerning the teaching of History in museological spaces, based on the narrative of an experience at the Rio Grande do Sul Memorial, a place that generated the teaching-learning process of students who visited this space.

Student Voices: This section highlights personal narratives that encompass a young learner's learning journey and encounters within STEM/STEAM classrooms. These stories reflect not only moments of challenge but also growth, inspiration, and creativity experienced in the learning environment. These narratives share a profound impact of how science is taught and how various teaching approaches encountered by a young learner have the potential to alter or transform their perspective and emotions towards science. These experiences contribute to a

broader understanding of the dynamics of STEM/STEAM education and its influence on young individuals. Mukherjee, a high school senior, reflects on her scientific journey in a computational biology laboratory and how the frustrations of the scientific process can become key learning moments. Her article, **Cell Death & Certainty**, is a personal narrative of Mukherjee's lived experience as a young STEM student.

In her article, **Tackling Demotivation in STEM Fields: A Student's Perspective**, Pandrangi, a freshman or first-year undergraduate student, recounts her STEM journey in high school. She discusses how domains of STEM/STEAM, where curiosity and creativity converge with high rigor, maintaining motivation and self-belief can be challenging. Self-doubt often looms for students like Pandrangi.. In this account, she shares her struggles in the STEM journey, specifically with a high school chemistry class and science fairs. Despite moments of discouragement, she found growth and inspiration, which now propels her to continue to embark on a career in STEM. In **The Influence of a STEM/STEAM Education Based High School on Students of the Ivoti Institute**, Richner explains all the benefits and opportunities that STEM/STEAM educational setting brings to the students in Brazil, and how it has affected his life personally. For that matter, this text aimed to determine the difference between the STEM/STEAM education High School model and the Traditional Basic General education High School Model. Another important objective is to explain the benefits of the STEM/STEAM High School format being implemented in the Ivoti Institute, in Rio Grande do Sul, Brazil.

Educators' Reflections: This section highlights teachers and educators' reflections on their lived experiences in the context of STEM and STEAM education. These articles offer insights into integrating arts and aesthetics into STEM, highlighting strategies to nurture creativity and innovation within the STEM/STEAM curriculum. The educators also share their personal reflections on the challenges encountered while implementing disruptive STEM/STEAM education methods. In **Disrupting STEM Education by Braiding Indigenous Ways of Knowing and Environmental Education**, Dodier explores the importance of acknowledging one's feelings, the power of storytelling, my journey educating myself and embracing multiple perspectives inside my teaching practice. According to the author, it is time to disrupt traditional STEM education by meaningfully embracing multiple perspectives such as Indigenous and environmental education learning principles. In **School Leadership Development for Sustainability in the Post-Digital Era**, Awodiji, Uleanya and Naicker examine school leadership development in a post-digital era from the sustainability perspective. According to them, to ensure sustainable education, school leaders must have relevant skills and competencies to lead schools in the post-digital age.

In the interview **Struggles and Triumphs of an Early Childhood STEM Educator: Why Connections Matter? An Interview with Ms. Jade Leong**, a researcher and an early childhood educator exploring pedagogical approaches to teach STEM to children aged 1 to 5. The conversation reveals insights into early childhood education challenges and solutions. Through the interview, it becomes evident that STEM training for teachers can be attributed to increased teacher confidence to teach science. The interview exposes a key issue—early childhood educators often are not given opportunities for professional development in teaching math and science, and may potentially impact teacher self-efficacy and quality of STEM education. In **Scientific Dissemination Practices in Basic Education: Reflections on a Brazilian Experience in a Public Technical School**, Campani assumes that it is a basic school commitment to contribute to scientific dissemination, scientific literacy, and the establishment of a culture of science in society, especially in Brazil, a country where scientific denialism is still very present. The purpose of this text is to reflect on the challenges and results of a practical experience with scientific dissemination at the Fundação Escola Técnica Liberato Salzano Vieira da Cunha, a public technical high school in Novo Hamburgo, Rio Grande do Sul, Brazil.

Artistic and Creative Expressions: In this section, authors present their creative works that challenge traditional science education teaching approaches, offering a fresh perspective on the integration of art in STEM/STEAM education. Authors share their lived creative expressions to delve into the intersection between STEM and the arts. Each artistic expression showcases the authors' process through mind, body, and heart on what it means to enact STEAM. The creative piece **Decoding**, by Asel, metaphorically represents the dyslexic experience, in which neurodivergent individuals who have dyslexia may struggle with the daily decoding of information within their cognitive load. His goal is to foster empathy towards neurodivergent individuals, countering stereotypes associated with people like himself. The creative piece, **Proposing How Art Could Be Used to Educate Science**, by Hoang Do, examines theories and examples between art and science, showing where they are similar, and how art and design can be used to educate and inform scientific data. The author aimed to do so by focusing on and comparing theories of physics, mainly those related to Isaac Newton, and art and design's color theories, showing how they are similar, and then proposing how art could be a bridge between science and the learner, how knowledge could be delivered as an experience.

The creative paper **Critical Pedagogy: a Creative Artistic Representation about Paulo Freire's Work**, by Hoerlle and Ribas, shows us the importance of Freire's way of teaching and, after all, his contributions to a non-traditional teaching. To do so, from a theoretical point of view, it drew on Giroux (1989), with regard to the critical pedagogy, based on Freire's work. In **Integrating Art Into STEM: An Intersubjective and Participatory Experience with Fellow Subjects**, Behrisch discusses the importance of integrating art into STEM to allow learners to have an immersive connection with their subjects, in stark contrast to traditional STEM's belief

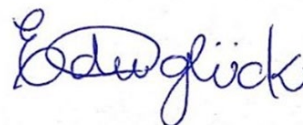
in separation from the world they study. Artistic practices like oil painting in STEM promote intersubjectivity, valuing emotional responses as data. Behrisch adds that this approach fosters a sense of kinship, shifting from objectification to connection. Behrisch's painting process illustrates a participatory relationship with a wild doe, yielding diverse subjectivities in a collaborative, intersubjective experience. This concept draws on David Abram and Goethe's theories of embodied knowledge and participatory observation.

We encourage our readers to explore this issue, delving into the heart, lived experiences, and stories that reflect the true essence of teaching, learning, and living in a diverse and inclusive educational landscape. It is a celebration of the connections between these diverse stories that will lead us toward a more equitable, rich, and inclusive future in science education.

Sincerely,



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