

Citations and Abstracts of the 2016 STEM special issue of *the Canadian Journal of Science, Mathematics and Technology Education*. I. DeCoito, A. Steele and K. Goodnough (guest editors).

DeCoito, I. (2016). STEM education in Canada: A knowledge synthesis. *Canadian Journal of Science, Mathematics and Technology Education*, 16(2), 114-128.

Abstract

Across Canada many initiatives have been initiated to generate more interest in science, technology, engineering, and mathematics (STEM) education; however, no single or comprehensive overview has been conducted that takes into account the impact of these STEM initiatives on teaching/learning outcomes in K–12 education. This knowledge synthesis of STEM initiatives was undertaken to explore the impact on teaching and learning in K–12 education and identify existing gaps/barriers in the current approaches in terms of engaging students and increasing interests and skills in STEM. The synthesis provides a national overview of STEM initiatives and programs, including successes, criteria for effective programs, and current research in STEM education.

Shanahan, M-C., Burke, L. E. C-A., & Francis, K. (2016). Using a boundary object perspective to reconsider the meaning of STEM in a Canadian context. *Canadian Journal of Science, Mathematics and Technology Education*, 16(2), 129-139.

Abstract

The term STEM, used to describe science, technology, engineering, and mathematics, has come to prominence in Canada over the last decade, raising questions about its meaning. Here we examine its history in the United States and the sociopolitical commitments that have, in parallel, guided science education in Canada. The divergent nature of these histories suggests that STEM may be best viewed as a boundary object, highlighting its value as a collaboration gathering point. This can allow science educators to engage with STEM in ways that are meaningful without necessarily accepting associated definitions and priorities.

Borden, L. L. & Wiseman, D. (2016). Considerations from places where indigenous and western ways of knowing, being, and doing circulate together: STEM as artifact of teaching and learning. *Canadian Journal of Science, Mathematics and Technology Education*, 16(2), 140-152.

Abstract

The editors have challenged us to consider STEM within the Canadian educational context. We find that the push to STEM is based on stories that frame the need for STEM within an economic imperative. Though some people are questioning the prevailing story and attempting to tell stories about STEM as a more integrated approach to teaching and learning, this work remains based in Western assumptions and philosophies. Based on our work alongside Aboriginal people, peoples, and communities, we offer another take on STEM, not as a framework for teaching and learning but rather as an artifact that

emerges from teaching and learning.

Franz-Odendaal, T. A., Blotnicky, K., French, F., & Joy, P. (2016). Experiences and perceptions of STEM subjects, careers, and engagement in STEM activities among middle school students in the Maritime provinces. *Canadian Journal of Science, Mathematics and Technology Education*, 16(2), 153-168.

Abstract

To enhance understanding of factors that might improve STEM career participation, we assessed students' self-perceptions of competency and interest in science/math, engagement in STEM activities outside of school, and knowledge of STEM career requirements. We show that the primary positive influencer directing students to a STEM career is high engagement in STEM activities. Our data also indicate that Grade 7 students do not grasp the importance of science/math requirements for future STEM careers. Further research is required to more fully explore the correlations between education and community influencers on the likelihood of choosing a STEM career identified in this study.

LópezLeiva, C., Roberts-Harris, D., & von Toll, E. (2016). Meaning making with motion is messy: Developing a STEM learning community. *Canadian Journal of Science, Mathematics and Technology Education*, 16(2), 169-182.

Abstract

Through a collaborative effort between a sixth-grade teacher and two university faculty, we designed an integrated unit to learn about motion and we learned that an integrated teaching and learning experience about motion is MESSY (i.e., it includes movement, engagement, social interactions, spontaneity, yikes, and yippees!). We engaged in a twofold goal process of integrating mathematics, science, and technology. First, we embedded an inquiry approach in our planning and facilitation of learning experiences. Second, students coconstructed their understandings of motion through collective inquiry. School and university faculty, as well as students, learned about inquiry, about using motion detectors to learn and teach about motion, and about how mutual respect and collaboration support productive STEM learning, teaching, and research.

Krug, D. & Shaw, A. (2016). Reconceptualizing ST® E(A)M(S) education for teacher education. *Canadian Journal of Science, Mathematics and Technology Education*, 16(2), 183-200.

Abstract

This article examines science, technology, engineering, and math (STEM) education as represented in North American educational contexts. In this article we will argue that the dominant view of STEM education as currently circulated and practiced in the United States and Canada is not much more than an acronym of discrete disciplinary areas. We offer a critical review of popular literature about STEM education and argue that too much emphasis in popular culture is currently on a quick fix of recent global economic conditions. Critical inquiry is proposed as a method for teacher candidates to reflexively deliberate on why curriculum integration (i.e., ®), the arts and humanities (i.e., (A)) and

sustainability education (i.e., (S)) are important areas of STEM education. We discuss why an integrated view of ST® E(A)M(S) education that honors disciplinary content but does not succumb to disciplinary isolation is needed.

Weinstein, M., Blades, D., & Gleason, S. C. (2016). Questioning power: Deframing the STEM discourse. *Canadian Journal of Science, Mathematics and Technology Education*, 16(2), 201-212.

Abstract

Internationally, STEM has become a slogan for organizing new discourses and practices in science education. In the form of a three-act play, we argue that STEM as social engineering orients and organizes school science education curriculum development in directions of scientific innovation and engineering that reinforce and legitimize a neoliberal hegemony of global competition and capitalist expansionism. The dialogue in the play presents an alternative conversation about the role of school science education amidst the sudden adoption of STEM. This conversation begins by examining the positivist assumption of STEM as societal salvation through the example of STEM in the invention, development, and deployment of new technologies, such as solar panels. The play then closely interrogates STEM as a curriculum orientation, shifting in the final act to possibilities for a different focus for science education curriculum development that includes interrogation and resistance to neoliberalism.