Chapter 9
Intersections of Integrated STEM and Socio-Scientific Issues

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ABSTRACT

Current policy documents across the world call for changes in K-12 science teaching to use integrated STEM strategies to provide a more authentic learning environment for students. Though the importance of integrated STEM education is established through national and international policy documents, there remains disagreement on focus, models, and effective approaches for integrated STEM instruction. A primary focus of STEM policies is addressing STEM workforce issues. However, other important foci for global STEM initiatives are more equitable education, poverty reduction, and increased STEM literacy and awareness. This chapter critiques current implementations of STEM as focused only on technical aspects of engineering design which will not meet any of the goals of integrated STEM. Rather, the authors propose that integration of SSI into STEM lessons will promote the social thinking necessary in engineering design and enhance work toward achieving not only STEM workforce preparation, but also increased STEM literacy and equity within STEM.

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INTRODUCTION

Current policy documents in the United States call for changes in K-12 science classrooms to employ integrated STEM strategies in order to provide a more authentic learning environment for students (National Academy of Sciences [NAS], 2014). Indeed, countries from across the world have established STEM policies and initiatives designed to improve the quality of STEM education (Freeman, Marginson, & Tytler, 2014). Though the importance of integrated STEM education is established through national and international policy documents, there remains disagreement on focus, models, and effective approaches for integrated STEM instruction (Bybee, 2010). However, a clearly stated, primary focus of STEM policies within the United States and many other Western countries is addressing STEM workforce issues. While less visible in the current STEM rhetoric, other equally important foci for global STEM initiatives are more equitable education, poverty reduction, and increased STEM literacy and awareness (Freeman et al., 2014; NAS, 2014).

While the argument that the United States is not producing adequate numbers of STEM graduates to meet the growing number of positions within these fields (Vilorio, 2014) dominates our national STEM rhetoric, STEM literacy is an equally important goal of current reforms (Honey, Pearson, & Schweingruber, 2014). Policy documents maintain that for students to become informed citizens who can make sense of our information rich, technologically advanced global environment, STEM literacy is necessary, even for those not working in a STEM field (Honey et al., 2014). Policy documents in the United States also call for STEM education access for *all* students (National Research Council [NRC], 2011; President's Council of Advisors in Science and Technology [PCAST], 2010). Yet, females and students of color remain under-represented in most STEM fields. Furthermore, a wide gap in STEM achievement persists between white students and under-represented minorities when compared to population demographics and the respective representation of these groups in the STEM fields (National Center for Science and Engineering Statistics, 2017). Indeed, reimagining STEM education to increase STEM participation for females and students of color would both help to meet workforce needs and ensure increased STEM literacy and participation for *all* students.

Teaching STEM from a workforce rationale is seen as problematic (e.g. Zeidler, 2016; Zeidler, Herman, Clough, Olson, Kahn, & Newton, 2016). Many proponents of teaching through socio-scientific issues (SSI) argue that goals such as increased STEM literacy cannot be achieved without the inclusion of humanistic and sociocultural values essential to acting as a democratic citizen (e.g. Kahn, 2015; Zeidler, 2014). Sadler, Barab and Scott (2007) argue that "the thoughtful negotiation of SSI is fundamental to modern notions of scientific literacy" (p. 372). Similarly, Kahn (2015) argues that by considering the humanistic approaches and moral development