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Exploring system dynamics of complex societal issues through socio-scientific models

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Research on socio-scientific issues (SSI) has revealed that it is critical for learners to develop a systematic understanding of the underlying issue. In this paper, we explore how modeling can facilitate students' systems thinking in the context of SSI. Building on evidence from prior research in promoting systems thinking skills through modeling in scientific contexts, we hypothesize that a similar modeling approach could effectively foster students' systematic understanding of complex societal issues. In particular, we investigate the affordances of socio-scientific models in promoting students' systems thinking in the context of COVID-19. We examine learners' experiences and reflections concerning three unique epistemic features of socio-scientific models, (1) knowledge representation, (2) knowledge justification, and (3) systems thinking. The findings of this study demonstrate that, due to the epistemic differences from traditional scientific modeling approach, engaging learners in developing socio-scientific models presents unique opportunities and challenges for SSI teaching and learning. It provides evidence that, socio-scientific models can serve as not only an effective but also an equitable tool for addressing this issue.

KEYWORDS

socio-scientific issues (SSI), modeling, systems thinking, epistemology, science education

Introduction

In the 21st century, we are confronted with a myriad of complex societal issues such as climate change that are multifaceted and lack universally agreed-upon solutions. These issues not only impact our day-to-day lives but also have long-lasting effects on the environment and society. As educators, we need to prepare future generations to navigate and respond to these complex issues as responsible citizens (De Paepe, 2009). Ideally, students should develop the skills necessary to critically evaluate scientific information, understand the social and ethical implications of scientific advancements, and engage in informed decision-making. However, science standards worldwide often fall short in promoting or achieving the full measure of these aims (Falkenstein and Korchgaden, 2015). A primary focus on canonical scientific knowledge and practices fails to address the need for learners to grapple with the real-world complexities that accompany complex societal issues.

Over the past two decades, researchers have explored socio-scientific issues (SSI), complex societal issues with connections to science knowledge, as meaningful learning contexts to promote scientific literacy (Sadler, 2009). Research on SSI has revealed that a significant challenge for learners is to appreciate the complexity of the systems associated with these issues (Sadler et al., 2007; Zedler, 2014). It is essential for learners to develop a systematic

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