

Chapter 11

Unifying Themes in Socioscientific Issues–Based Instruction for Scientific Literacy Development

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ABSTRACT

This chapter presents the unifying themes in socioscientific issues-based instruction for scientific literacy development. Section 1 presented an overview of how to effectively implement socioscientific issues in the elementary grades to provide students with opportunities to apply science to their everyday lives. Section 2 built upon where the authors left off in section one. In this section, the authors used real-world scientific context to provide opportunities to use character and values and moral reasoning as they think about finding solutions to real-world scientific problems. Section 3 showed the continued use of socioscientific issues with an upward trajectory to enhance scientific literacy at the college level. Section 4 demonstrated socioscientific issues being successfully implemented at the core of the P-12 educational system. In Section 5, the authors revealed the integrative nature among STEM, model-based learning, and socioscientific issues in achieving scientific literacy.

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INTRODUCTION

The COVID-19 Pandemic highlights the urgent need to enhance scientific literacy among the American public in general and school-age children in particular. As thousands of Americans succumbed to contracting the Coronavirus, many policymakers in the United States federal and state governments seem to disregard known scientific principles, practices, and findings regarding the type of medication to use and the scientific processes required to produce vaccines. Some of these policymakers even advocated for widespread use of antimalarial medicines such as Hydroxychloroquine to treat COVID-19, asking the people what do they have to lose by not taking Hydroxychloroquine, when leading scientists are saying potentially one's life because of the harmful side effects of this medication. The Center for Disease Control and Prevention had to put out bulletins to warn the public against ingesting household cleaners and disinfectants to treat the COVID-19. Many in government even disregard the warnings of scientists on the wearing of face masks and social distancing as the United States move towards re-opening its economy. These dangerous suggestions by policymakers highlight the urgency needed to develop scientific literacy among the public in general, and school-age children in particular. The most recent PISA report defined scientific literacy as follows:

Scientific literacy is the ability to engage with science-related issues, and with the ideas of science, as a reflective citizen. A scientifically literate person is willing to engage in reasoned discourse about science and technology, which requires the competencies to explain phenomena scientifically, evaluate and design scientific enquiry, and interpret data and evidence scientifically. (OECD, 2018, p. 75)

PISA's definition of scientific literacy features three competencies. These are:

1. Ability to explain phenomena scientifically
2. The ability to interpret data and evidence scientifically
3. Ability to evaluate and design scientific enquiry

The socioscientific issues framework is critical to helping students achieve the identified scientific literacy competencies. Socioscientific issues ill-structured nature enables students to engage in discourse on real-world scientific problems that are socially-related (Zeidler, 2014). Studies have shown that socioscientific issues enhance students' abilities to explain phenomena scientifically (Kosterman & Sadler, 2009; Nielson, 2012; Sadler, Klosterman, & Topcu, 2011; Zeidler, Sadler, Simmons, & Howes, 2005). Additionally, socioscientific issues have shown to impact students' ability to evaluate and design scientific inquiry (Zeidler, Applebaum, &

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