Chapter 9
Localizing Socioscientific Issues and Globalizing Citizen Science Through Computer-Supported Collaborative Learning

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ABSTRACT

Science education has given an increasing amount of attention to incorporating real-life issues into science curricula and engaging students in practices similar to those of scientists, most recently via the fields of socioscientific issues (SSI) and citizen science (CS). Frequently, socioscientific issues focus on globalized problems, while citizen science focuses on localized issues. For meaningful engagement with these two approaches, this chapter advocates for incorporating computer-supported collaborative learning (CSCL). The chapter introduces and defines SSI, CS, and CSCL. Then, it discusses the major affordances of CSCL to bridge SSI and CS. The author presents three key areas in which CS, the study of SSI, and CSCL environments can work together to cohesively advance both joint and individual purposes. The chapter concludes with a seven-step instructional sequence arguing for localizing SSI and globalizing CS via local and large-scale collaboration.

INTRODUCTION

Scientific Literacy

One of the fundamental tenets of science education is to cultivate scientifically literate citizens. However, scientific literacy has been defined in many ways. Roberts (2007) identified two visions of scientific literacy. Vision I advocates for science education that focuses on the processes and products of natural science. Vision II envisions science education as a tool to engage students in real-life problem-solving contexts that the students would encounter as citizens. In this chapter, the Vision II perspective is ad-

DOI: 10.4018/978-1-5225-9746-9.ch009

opted. This perspective encourages students' engagement in decision-making processes about real-life problems. In turn, the overall goal is preparing citizens of modern societies to be future decision-makers in scientific-technologic endeavors (Sadler, 2011).

Among the many approaches to promoting scientific literacy for all, the "science-technology and society" movement (STS) has been in the spotlight for many years (Aikenhead, 1994). STS is situated around the idea that science curricula should focus on the real and controversial issues that societies face. Therefore, according to this movement, the main objective of science education is to engage students in decision making about science-related, open-ended social problems based on scientific knowledge and taking social action (Tal & Kedmi, 2006). However, this approach was criticized for not engaging students in moral, ethical, and cultural considerations of the issues, and for losing its focus on meaningful engagement in argumentation and nature-of-science considerations (Zeidler, Sadler, Simmons, & Howes, 2005). In other words, the STS movement's pedagogical applications in science classrooms came under critique. Therefore, researchers have begun to call for new approaches, remodeled to consider students' moral and ethical development. To that end, the authors of this chapter focus on current socioscientific issues and citizen science approaches. The chapter is mainly a literature review and the surrounding discussion.

BACKGROUND

Comparing Socioscientific Issues (SSI) and Citizen Science

Teaching socioscientific issues is a pedagogical approach aimed to engage students in decision making around controversial issues by making moral and ethical judgments. Its developers worked to consider the psychological and sociological development of learners (Zeidler et al., 2005). Citizen science, on the other hand, centers itself around the idea that individuals (even those not trained as scientists) can be engaged in collecting, categorizing, and analyzing data—i.e., involved in doing science with the guidance of professional scientists. This approach promotes collaborative research projects between professional scientists and members of the public around real-world problems. SSI is situated around more or less globalized issues (Seethaler & Linn, 2004); in citizen science projects, volunteers take active roles in a local research study. These collaborations could be informal science learning or outreach projects designed to ignite public curiosity towards science and promote scientific understanding of real-life issues. SSI teaching and citizen science promise to engage students in both real-world problems and scientific practices, such as engaging argumentation from evidence, constructing explanations, analyzing and interpreting data, using mathematics, and computational thinking.

The science education community has witnessed a great amount of research on SSI in recent years (Bayram-Jacobs et al., 2019; Dawson & Carson, 2018; Kim, Ko, & Lee, 2019; Lindahl, Folkesson, & Zeidler, 2019). Students' reasoning, argumentation, and decision-making skills regarding SSI were investigated frequently in formal educational settings (Atabey & Topcu, 2017; Demircioğlu & Uçar, 2014; Emery, Harlow, Whitmer, & Gaines, 2017; Fang, Hsu, & Lin, 2019; Xiao, 2018). On the contrary, citizen science (CS) is an emerging pedagogy in science education, particularly its focus on issues in more localized settings (Karrow & Fazio, 2010; Land-Zandstra, Devilee, Snik, Buurmeijer, & van den Broek, 2016; Strasser, Baudry, Mahr, Sanchez, & Tancoigne, 2019). There are few studies which localize SSI and globalize CS practices in science education. This combination of practices is particularly