Chapter 18
Community Engagement in the Earth Sciences:
A Situated Learning Model at Wittenberg University

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ABSTRACT

Situated learning posits that all learning happens in context. Applied to earth resilience challenges (e.g., water, climate, hazards), learning should include building the skills, habits, and relationships needed for participatory and equitable community planning and political change. Students should encounter the operational context needed to enact geoscience in communities (e.g., jurisdictional, institutional, political, cultural, information-sharing). This work describes how the geology and environmental science programs at Wittenberg University, a four-year, liberal arts college, use community engagement to deepen student preparation. Together, both programs are recognized as exemplars in civic learning and democratic engagement by the American Association of Colleges and Universities. It especially highlights how community engagement prepares graduates for work in communities by 1) designing courses around community priorities and authentic data analyses and 2) modeling partnering and project evolution as key modes for improving community outcomes.

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INTRODUCTION: EARTH RESILIENCE CHALLENGES CALL FOR SITUATED LEARNING

An earth, or geoscience education, is defined as the study of earth processes, history and systems interactions, including earth-human systems and associated problem solving (Manduca & Kastens, 2012). Core disciplinary skills and habits include observation, spatial and temporal organization, recognition of slow and fast, or catastrophic processes (e.g. a meteor impact) (Manduca & Kastens, 2012). Likewise, earth scientists possess systems thinking abilities such as knowledge of feedback loops or other behaviors that may be specialized to the particular field they engage in (e.g. seismologist, glaciologist, etc.). Earth scientists also have field skills and skills in data representation in spatial or other forms that aid interpretation of critical processes. Finally, because geoscientists pull together information from multiple lines of evidence, collaboration is core to geoscientific expertise (Manduca & Kastens, 2012).

Recently, earth educators and practitioners have recognized a need to advance geoscience for equitable and just outcomes (e.g. Fortner, Manduca, Guertin, Szymanski, & Villalobos, 2019; National Research Council [NRC], 2012). For example, in 2016, the National Academies brought together civic practitioners in a workshop exploring the potential of service learning in the geosciences (National Academies of Sciences, Engineering, and Medicine [NAS], 2017). Within that workshop, dominant examples of service learning in the geosciences were found to be centered on sustainability challenges, including water, climate, soil, hazards, and environmental pollution (NAS, 2017). It is not surprising that the potential of civic engagement has only been considered recently in the geosciences. Only in the last decade have geoscience consensus reports emerged that specifically describe a need to co-develop solutions with vulnerable communities to improve outcomes (e.g. NRC, 2012). It is also not likely that geoscience students are alone in their disconnect from community priorities. Only 38% of physical science majors graduating from college that were surveyed through the National Survey of Student Engagement (NSSE) responded that they “often” or “very often” connected their learning to societal issues (NSSE, 2016). Across all majors, engagement around local or campus issues is also much lower compared to global issues (NSSE, 2016). In fact, less than 21% of all graduates report that they “often” or “very often” raise awareness or ask others to address or advocate for local or campus issues (NSSE, 2016).

Given the potential for civic engagement in earth education and the current lack of participation, there is a true need to share models for incorporating civic practices, especially those that highlight how disciplinary skills and habits and civic skills and habits are incorporated. Earth and environmental sustainability issues, such as those related to natural hazards, energy, hydrologic forecasting, pollution, land use, climate change, infectious disease, and material use-reuse and management for the global commons (American Geosciences Institute [AGI], 2016; NRC, 2001), are not solved through disciplinary skills and knowledge alone but through engaging in and with the expertise of the communities. Addressing these challenges requires moving from collaboration with other geoscientists to co-planning between geoscientists and communities (i.e. participatory decision making) (NRC, 2001; Silka, 2010). Moving toward systematic collaboration (Cortese, 2003) should engage students in the complex navigation of operational parameters (e.g. codes, policies, and interpersonal factors) that guide outcomes (Thabrew, Wiek, & Ries, 2009). For example, a well-prepared earth and environmental science workforce must be equipped to integrate multiple perspectives (i.e. think beyond science alone) and empower communities within the scientific process (Fortner et al., 2019). Kelly and Knowles (2016) argue that Science Technology Engineering and Mathematics (STEM) educators must teach in connection to real-world issues or risk isolating their discipline from applied problem solving.

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