

Chapter 42

Using Project-Based Learning to Teach Sustainability Issues to Elementary Students

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ABSTRACT

This chapter describes a project-based learning unit on sustainability that was implemented in a fourth grade classroom by an informal educator (the second author) employed by a local waste management district. Previous instruction by the informal educator consisted of one-hour lessons that were separate units lacking the project-based learning format and transition links. This chapter describes a mixed-method case study in which pre and posttest tests as well as focus group interviews assessed students' learning as a result of participating in a cohesive project-based learning unit designed by the authors. There was a statistically significant change ($p < 0.05$) in students' pre to posttest scores, and focus group interviews indicated that students could elaborate much more deeply on their ideas about sustainability after the program. The authors conclude that project-based learning can support students' understandings of sustainability while providing an engaging and enriching format to informal educator programs.

INTRODUCTION

The history of sustainability education is complex, and a variety of terms (e.g., conservation education, outdoor education, and environmental education) have been used to describe similar approaches. For the purposes of this chapter,

we will use the term sustainability education unless we are quoting another author. The term “sustainability” has been defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland, 1987, p. 41). Thomas and Muga (2012) note, “while there are

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varying definitions of sustainability from different sectors of industry, what is important is that it strives for protection of the environment, prudent use of natural resources, equitable social progress, and maintenance of economic well-being without compromising the environment and society” (p. 264). Few would argue that future generations deserve a healthy and fruitful environment in which to live, however the current rate of development in many Western countries, coupled with global population growth, causes a great strain on our environmental and natural resources. While some believe that new technologies allow for the current rate of development to continue while causing less strain on the environment, the reality is that we must concurrently learn to minimize our impact. Education for sustainability can occur in a variety of venues, including in the home, in the classroom, or in informal education settings.

Sustainability education can play a versatile role in curriculum as it lends itself to interdisciplinary instruction and can facilitate connections between informal and formal classroom instruction. Informal science education is supported as a complement to formal education (or education in classroom settings) in a variety of contexts. Sustainability education is sometimes considered informal science education as it often occurs outside of the classroom or by an educator that is not employed by the school district. Formal classroom teachers could infuse sustainability into their curriculum and standards, but often do not because the connections within the standards to sustainability are rarely explicit. Research suggests that only teachers who have a great interest in nature and the environment take the time to infuse sustainability into their curriculum (McKeown-Ice, 2000) - a concern shared by our own informal educator as an impetus to this study. It is important to note that the *Next Generation Science Standards* (NRC, 2013) include more focus on sustainability than many of the previous state science standards.

To explore how sustainability best be approached in the elementary classroom, we posit

that an informal educator could successfully teach sustainability education in a classroom most effectively through a project-based learning (PBL) framework. Given its emphasis on interdisciplinary reasoning and its flexible design structure, we assert PBL can offer a meeting point for informal and formal educators. The PBL framework allows students to resolve complex socioscientific issues while exploring multiple perspectives and a variety of resources. Ramsey (1993) states “science education should produce students who can and do participate in the investigation and resolution of science-related social issues” (p. 414). In that vein, science educators can teach social responsibility through sustainability education, which provides a complementary opportunity to integrate formal and informal education. Tal (2004) notes that the very nature of sustainability education, often focusing on local, socio-scientific issues, allows for partnerships between schools and communities.

Project-Based Learning

Research and practice calls for a constructivist approach to sustainability education to “design, develop, and test specific teaching strategies for developing environmental conceptions that address the cognitive, affective, and behavioral dimension” (Ballantyne & Packer, 1996, p. 30). Sustainability education offers the opportunity for students to engage in problem-solving and action-based activities, whereas traditional formal educational settings are often structured with linear curricula that are teacher-centered. Thus, strategies to support both aims and structures are needed. Recent science educational reform efforts for adolescents have attempted to engage students in science by utilizing project-based instruction (Rivet & Krajcik, 2008). In the PBL approach, teachers act as facilitators to student learning as students have access to technology in the classroom that allows them to cooperatively explore and guide their learning, organize their work, and manage their time. This sort of learning environment,

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