Chapter 15

Water Ecology, Engineering, and Global Citizenship: A Science and Literacy Integrative Unit

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ABSTRACT

This chapter describes a science and literacy integrative unit on water ecology and reading about water purification in post-civil war Sudan through the text A Long Walk to Water by Linda Sue Park, 2010. The authors describe the process of integration according to the 5E learning cycle: engage, explore, explain, elaborate, evaluate. This teaching scenario is also further explicated through connections to The Next Generation Science Standards (NGSS) and overlapping practices between NGSS and The Common Core State Standards in English Language Arts. Aspects of the text are used in conjunction with the hands-on science inquiry to dig deeper into the standards.

INTRODUCTION

In recent years, researchers, practitioners, and teachers have manifested an increased interest in educational curricula that give priority to the integration of science and literacy. Throughout history, educational theorists have promoted cross-disciplinary integration as instructional practice vs. segmenting the disciplines to teach in isolation (Drake & Burns, 2004). Dewey (1915), one of the leaders in the movement for school reform during the Progressive Era, summed up the idea behind content integration by noting that “We do not have a series of stratified earths, one of which is mathematical, another physical, another historical, and so on. All studies grow out of relations in the one great common world” (p.80).

Historically speaking, such ideals of interconnectedness within educational curricula have withstood the test of time, and, as research continues to support interdisciplinary connections in both pedagogical practice and curriculum design (National Research Council, 2014), classroom practitioners are left...
to make decisions about how to integrate in ways that can engage their students and boost learning. Integration practices in the middle grades should be considered along with the vertical and horizontal overlap of content standards in the areas of reading, writing, listening, speaking, literature, science, and technology. Such

**HOW DO I DO IT?**

Interdisciplinary teaching employs multiple content areas simultaneously, in order to boost achievement in all areas. For instance, through linking separate content areas with a theme or a localized problem in problem-based learning, teachers can link multiple content area standards together in a unit of study around a common thread and address several areas at once.

To this effect, this chapter aims to present an example of science and literacy integration in the area of water ecology and the investigation of water as a global initiative to extend opportunities for underdeveloped countries to access clean water. Within this unit, the authors address the following guiding documents that undergird the work:

1. Next Generation Science Standards (NGSS).
2. Common Core State Standards (CCSS).
3. The Five E instructional model (5E).

The scenario of science and literacy integration that the chapter illustrates happened in a middle school context in the Southeastern United States, across a four-week period in the 2015-2016 academic year. This unit of study was unique, as it involved the synthesis of the following: 1) Seventh Grade English Language Arts (ELA) CCSS (National Governors Association, Center for Best Practices, & Council of Chief State School Officers, 2010); 2) NGSS (Achieve Inc., 2013); 3) the 5E instructional model format for teaching inquiry-based science (Bybee, 2015), which provided students opportunities to construct their own understandings of scientific concepts as they cycled through the following phases: Engage, Explore, Explain, Elaborate, and Evaluate. Chitman-Booker and Kopp (2013) explained the 5E instructional model is:

_A series of phases that teachers follow to help students reach a deep and thorough understanding of science concepts. Each phase serves a specific purpose. When followed sequentially, the model provides students with a cohesive instruction plan, one that leads to the learner’s formulation of a better understanding of scientific and technological knowledge, attitudes, and skills. (p. 21)_

This learning cycle is thus used in the authors’ scenario of science and literacy integration to illustrate students’ work with water ecology and global citizenship as well as to provide an organizational feature to the teacher’s planning of the unit, in order to effectively interweave the work of literacy and science practices together.
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