Chapter 47
An Interdisciplinary Exploration of the Climate Change Issue and Implications for Teaching STEM Through Inquiry

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ABSTRACT

The importance of science, technology, engineering, and mathematics (STEM) disciplines, and teaching through an inquiry approach, are critical facets in education today. The purpose of this chapter is to share useful observations and recommendations about teaching STEM through inquiry for practicing teachers. Three cases are used to collect data about participant interactions with an interdisciplinary activity related to climate change, human population growth, and atmospheric pollution (e.g., greenhouse gases and smog). Fifty-five participants, most of whom were pre-service teachers, completed a technology-rich activity, post-test assessment, and survey about the experience. The findings discussed include research results, the perspectives of the facilitating instructor, and recommendations for teaching technology-laden investigations through an inquiry approach. In general, the challenges related to teaching with technology and time constraints were found to be significant limiting factors in the success of inquiry-based teaching in STEM.

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INTRODUCTION

Inquiry-based instruction and the promotion of interest in science, technology, engineering, and mathematics (STEM) disciplines are at the forefront of education in America today. This is evidenced by the emphases in both the science and mathematics national standards. It is no longer sufficient to learn about STEM topics in schools, rather students are expected to utilize and implement the strategies and processes that practicing professionals use on a regular basis. Nowhere are the use of inquiry methodology and the introduction of the importance of STEM disciplines more important than in K-12 schools; it is here that students are most likely to be influenced by exposure to these issues. The necessity of proper training opportunities and experiences for pre- and in-service teachers to learn, develop, and practice relevant skills and models of higher order thinking should not be understated.

The purpose of this chapter is to relay the findings of case-study research that was designed to explore an interdisciplinary, inquiry-based approach to teaching undergraduate pre-service teachers about climate change, in order to share observations and speculations about teaching STEM disciplines within the context of an inquiry instructional model. The findings and teacher-perspectives are shared in order to consider the struggles and potential obstacles to inquiry-based teaching in a technology-rich scenario, and to propose recommendations for dealing with them. Below, we share three cases related to the application of technology to inquiry-based, interdisciplinary approaches to learning about STEM topics and the struggles that pre-service teachers (and their university instructors) experienced with managing them. The cases themselves explore interdisciplinary relationships among science, math, geography, and literacy, within the confines of a technology-centered lesson.

BACKGROUND

The National Science Teachers Association (NSTA) Board of Directors stated the following as part of their official position about scientific inquiry:

Scientific inquiry reflects how scientists come to understand the natural world, and it is at the heart of how students learn. From a very early age, children interact with their environment, ask questions, and seek ways to answer those questions. Understanding science content is significantly enhanced when ideas are anchored to inquiry experiences. (NSTA, 2004)

Inquiry-based learning not only makes sense from a science perspective but also from the perspective of effective learning. Learning is essentially a social activity that requires the active engagement of the learner to construct meaning from the experience. Generally, the learner must perceive the experience to be useful and relevant in order to participate (Vosdianou, 2007). The inquiry process, based on Dewey's philosophy that education begins with the curiosity of the learner, integrates these essentials of effective learning through the four primary interests of the learner: *inquiry*—the natural desire to learn; *communication*—the propensity to enter into social relationships; *construction*—the delight in creating things; and *expression,* or reflection—the desire to extract meaning from experience (Bruce & Bishop, 2002). A simple but logical rationale for inquiry-based instruction is found within the very definition of science. *Science* is a process of investigating the nature of the universe and asking questions is the essence of this process (Matson & Parsons, 2006).