Chapter 51

The Role of Authentic Science Research and Education Outreach in Increasing Community Resilience:
Case Studies Using Informal Education to Address Ocean Acidification and Healthy Soils

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ABSTRACT

Active, multi-dimensional learning is needed to establish higher-level scientific inquiry. Researchers who are engaged in scientific discovery are a valuable resource to communicate the link between science, society, and sustainability. Nontraditional settings like faith-based organizations and hobbies can play an important role in fostering greater scientific understanding. This chapter highlights the role that community structure (social, racial, and economic demographics) plays in developing successful project components by considering various theoretical frameworks to communicate sustainability principles to underserved communities. The researchers in these case studies presented the topics of ocean acidification and healthy soil to inner-city communities in Tampa, FL and Philadelphia, PA by utilizing authentic science research activities. Learners maximized the opportunities to construct new hypotheses and improve decision-making related to environmental stewardship behaviors and food security issues. A secondary but transformative outcome was increased interest in STEM fields among youth in cities with traditionally low performing schools.

ORGANIZATIONAL BACKGROUND

Education is critical for achieving environmental and ethical awareness, values and attitudes, skills and behaviour consistent with sustainable development and for effective public participation in decision-making. Both formal and non-formal education are indispensable to... sustainable development, United Nations Agenda 21: Chapter 36

Education plays a vital role in developing sustainable healthy communities with well-informed citizenry. The years 2005-2014 have been termed by the United Nations as the Decade of Education for Sustainable Development with an overarching mission "to integrate the principles, values, and practices of sustainable development into all aspects of education and learning" (UNCED, 1992). The overall goal of the initiative is to involve individuals and stakeholders (i.e. youth, educators, media, business owners) in collectively improving the global quality of life by establishing economic, societal, environmental, and political cohesion (UNCED, 1992). It is essential to recognize the challenges of implementing such an ambitious plan. For educators and citizens in the United States, a major hurdle is reconciling the current state of the U.S. education system into a system that effectively brings an understanding of sustainable development (both in definition and implications) and a capacity to equip emerging leaders with tools to solve the challenge of reducing global poverty, restoring and maintaining healthy natural resources, and ensuring access to political and economic stability.

A major challenge within the United States' public school system stemming from federal policy (United States Department of Education) is the increased focus on standards-based reforms and choice-testing as a means of performance evaluation. Within the current context of performance-based testing, sustainability concepts are rarely addressed (Rauch, 2002). Educators and school officials have limited time and resources to ex-pound on topics which are not directly related to the content of the state-issued standardized tests and therefore introducing sustainable development concepts into the curriculum often becomes unfeasible (Au, 2007). Moreover, the emphasis on testing requires students to recite facts rather than develop the critical thinking skills necessary for basic living and scientific literacy (Au, 2007). In the current setting where standardized testing is a reality, creative approaches and partnerships are needed to provide opportunities for students to fully develop their capacity to solve broad local, regional and/or global problems (Kim, 2008). It is essential to address the current concerns about the U.S. education system from both the student and the educator perspective.

For students, the current system of education can perpetuate student disengagement from the learning process particularly among low income and minority students (Kodrzycki, 2002). The problem is exacerbated by inadequately trained teachers which lack specialization and/or real-world experience in the subject areas that they teach (Loucks-Horsley & Matsumoto, 1999; Roehrig & Luft, 2006) and rigidity in the curriculum that does not reflect the natural dynamic process of learning. In this environment, it can be challenging for educators to fully accommodate students with varying interests and learning styles. Additionally, overly-structured education models limit both student and educator creativity and imagination (Kim, 2011) thereby hindering the critical thinking process (Lloyd, 1999). There is often a perceived relationship between school outcomes and the availability of funding for underserved urban schools, in particular (Hanushek, 1997; Hedges, Laine, & Greenwald, 1994). Even though per pupil expenditure, class size, and access to technology are all factors which can influence student performance (Valadez & Durán, 2007), it is equally important to assess the role pedagogy, motivation (of both the educator and the student) and empowerment play in cultivating an academic culture which fosters student achievement.

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