



The potential of community-based sustainability projects for deep learning initiatives



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ABSTRACT

This paper provides and illustrates a generic framework for deep learning in a Sustainability-based course for higher education instruction. The use of Sustainability Consulting Projects is detailed with potential application to similar programs as part of their Sustainable Education curriculum. Using four disparate institutions of higher learning across the eastern coast of the United States we can complete an exploratory analysis of the framework. This analysis will provide us opportunity to identify and characterize community sustainability projects and their contribution to higher order, integrative and reflective learning. This deep learning framework and model will be helpful to curriculum developers and instructors who wish to introduce these types of projects into their courses and curriculum. These processes and tools may be integrated into current Sustainability Management courses or used as the basis for development of specific courses focused specifically on this topic; e.g., Sustainability Consulting or as a capstone course. Lessons learned and framework design and implementation provide opportunities for further research and development of these courses.

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1. Introduction

In recent years, the pervasiveness of sustainability education at the college, or tertiary level, has been in response to a variety of social forces that have caused increasing sustainability awareness among various stakeholders. Communities, industry, consumers, NGO's, and government agencies have each played a role in greater demand for deep knowledge of sustainability, its principles, practices and theories (Yarime et al., 2012). The advent of these stakeholder pressures has caused significant response across a variety of academic disciplines including social sciences, engineering, and business disciplines (Wiek et al., 2011).

In response to these needs universities throughout the world are introducing new programs, pedagogical techniques, practices, and resources with respect to environmental sustainability (James and Card, 2012; Krizek et al., 2012; Velazquez et al., 2005). Increasing emphasis is being placed on the integration of sustainability into business and management curriculum. This integration

is especially pertinent within business education as business programs seek further legitimacy by offering sustainability in their curriculum (Boyle, 2004).

Sustainability is a complex topic and has been defined in a variety of ways (Arena et al., 2009). We focus on environmental sustainability education, but the expansion to other 'triple-bottom-line' dimensions can occur. Economic and social issues are related to environment sustainability actions.

Over the past several years a number of studies have been published on how to integrate sustainability into higher education including studies focused on business and management education (e.g., Krizek et al., 2012; Martin and Samels, 2012; Velazquez et al., 2005; Rusinko and Sama, 2009). Both academics and practitioners have observed the need to integrate sustainability into management education and across the business school, e.g., into faculty research and administrative practices (Rusinko and Sama, 2009). Thus, schools of business are using diverse means to implement their sustainability education goals, including (McMillan and Higgs, 2003; Ceulemans and De Prins, 2010):

- *infusion* of sustainability into current courses
- *new courses* specifically focused on sustainability
- *activities and programs* within and outside of the curriculum
- *modeling of sustainable practices* through the school facilities, operations, governance, and faculty lifestyles.

Abbreviations: HIEP, High-Impact Educational Practices; NSSE, National Survey of Student Engagement; SAP, Sustainability Action Plan; SOW, Statement of Work.

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An important and proactive approach to aid 'deep learning' for sustainability amongst business and management students is through the use of high impact educational practices (HIEP) such as community based sustainability projects (Hansen et al., 2012; Kuh, 2008). In this paper the case-based research study examines the use of community-based sustainability projects as an integral part of a deep learning curriculum offered by management, engineering, and even public policy (social science) disciplines in university settings. The tools, effectiveness, and limitations of such a program is a research question that will be examined. That is, two primary research questions will be answered by this study: 1. How well do community-based sustainability projects contribute to deep learning and deep learning outcomes for University students; and 2. Does a deep learning framework aid in the design and management of sustainability education?

Using a course that has been delivered in four university case study settings we provide instructors and pedagogical researchers with insights into the effectiveness and limitations of the use of community-based sustainability projects courses and High Impact Educational Practices (HIEP) focusing on environmental sustainability management. We focus on innovative sustainability consulting projects to help students achieve deep learning outcomes. Another contribution of this paper is a general framework bringing together the antecedents to deep learning, deep learning practices, and deep learning outcomes in a graduate professional school sustainability education environment. The framework can be a valuable process oriented tool in observing, designing, and evaluating sustainability courses and programs. Practically, pedagogical materials for a course utilizing sustainability consulting projects are also presented for use by instructors and researchers.

In the next section we begin by providing background from the literature on HIEP, deep learning and stakeholder outcomes. This background sets the theoretical and practice framework for introducing the application of community based sustainability projects courses. Background on the design of these courses and the university settings are then provided. Findings from the many projects completed in these courses with feedback from instructors, students and project participants are presented. General findings and lessons learned are summarized with avenues for future development and research in this important and evolving instructional method and topic also presented in the concluding sections of this paper.

2. Background – high impact educational practices, deep learning and stakeholder outcomes

The core elements of a high impact post-graduate education include the development of intellectual powers and capacities; ethical and civic preparation; personal growth and self-direction (Kuh, 2008; Barth, 2012). HIEP for higher education can help achieve long-lasting, deep learning and outcomes. HIEP practices represent the antecedents in our framework for deep learning and outcomes summarized in Fig. 1. The elements of the framework, HIEP, deep learning and outcomes are each described in this section.

HIEP include: common intellectual experiences that link various courses; a focus on 'big questions'; writing intensity; collaborative projects; research; and community based experiences and service oriented activities (Kuh, 2008).

Many HIEP have been targeted at undergraduate students. Similar practices at the graduate level, especially for relatively inexperienced graduate students, and as discussed later provide deep learning outcomes. The more complex a subject, the less possible it is for participants to achieve mastery through passive educational practices. HIEP are especially conducive for education

in complex and socially integrated issues exemplified by sustainability (von Blottnitz, 2006). Sustainability requires a systemic 'big picture' and asking 'big questions' perspective to fully comprehend the myriad issues that are faced by this topic and discipline (Feng, 2012; Frisk and Larson, 2011; Hansen et al., 2012; Porter and Cordoba, 2009).

Building on Kuh's (2008) HIEP, cross-disciplinary and multiple course perspectives may also be integrated into environmental sustainability understanding and education (Feng, 2012; Yarime et al., 2012). Collaborative projects, writing intensity, research, community, service-oriented practices are all experiential and are recommended for sustainability education practices (Ferreira et al., 2006; Bergeà et al., 2006; Sipos et al., 2008).

Deep learning has been defined as a key learning strategy from which students extract meaning and understanding from course materials and experiences (Warburton, 2003). Deep learning is defined to go beyond simple intellectual development becoming more transformational, which includes physical, emotional, aesthetic, moral, social, personal, and spiritual growth (Bentz, 1992; Grauerholz, 2001; Miller, 1999; Sterling, 2010). Although there are many scales for deep learning (see Nelson Laird et al., 2005 for a review), in our conceptual framework of deep learning the scales of the national survey of student engagement (NSSE) (NSSE, 2012), based on Nelson Laird's work (2008), are used. These elements and scales are some of the most comprehensive and tested and thus serve as a solid basis for evaluating deep learning in academic settings.

The deep learning elements of this comprehensive scale include higher order learning, integrative learning, and reflective learning (Nelson Laird et al., 2008). A summary of the specific elements in the NSSE Deep Learning Scale are shown in Fig. 1. Our evaluation and exploration of sustainability education in business and professional schools in this paper is qualitative. Thus, we do not explicitly use this scale in the evaluation of our case study results, but point to some features and results around the three major categories of HIEP. These results are what can be measured from the various HIEP that sustainable instruction can effectively implement due to sustainability's characteristics, especially organizational environmental sustainability characteristics.

The next stage of the conceptual framework includes the outcomes of the practices and deep learning that occurs. We summarize the outcomes as various stakeholder benefits from deep learning and HIEP, which include (Schantz and Louge, 2008):

- Academic gains and school connectedness by students (Scales and Roehlkepartain, 2005),
- Greater civic engagement of students helping to build 'town-gown' relationships and future community engagement in the future (Boyle et al., 2011).
- Building non-discipline, personal and social competencies of students (Hoxmeir and Lenk, 2003).
- Building social capital for students and schools. (Koliba et al., 2006).
- Protective factors such as greater retention rates and higher quality relationships.
- Broadened career exploration for students.

The variety of stakeholders that benefit from HIEP and deep learning with sustainability as a focus includes students, the university, college or school, and the broader community (Yarime et al., 2012). A systems perspective of sustainability higher education not only requires consideration of the content and the pedagogical delivery, but the stakeholders that will benefit from this broad education (Porter and Cordoba, 2009). Thus, in our final stage we consider the stakeholder outcomes from the cases presented in this paper.

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