



Sustainability in higher education courses: Multiple learning outcomes



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ABSTRACT

In this study a comprehensive approach to learning outcomes of sustainability in higher education is suggested, based on literature review, and data gathered from 13 undergraduate courses offered in a science and engineering university. All the courses integrated environmental topics. Data of self-reported students' outcomes were collected at the end of each course through open-ended questions, and were analyzed to identify learning outcomes that promote sustainability. We found that although most courses equipped the students with theoretical knowledge about the environment, they differed a lot in the overall number and the variety of reported learning outcomes. The suggested theoretical framework, and findings of this study can inform design of future courses and programs that aim to promote sustainability literate students.

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Introduction

There is general agreement, nowadays among researchers and policy makers that a tremendous effect on the natural environment and on eco-systems is wrought through individual, corporate and national activity (e.g. Ashford, 2004; Intergovernmental Panel on Climate Change, 2007; Orr, 1995; Swim et al., 2011) Education is considered to have an important role in promoting sustainable ways of life (UNESCO, 1992).

Education for sustainability (EfS) is defined as education that aims to prepare people to cope with and find solutions to problems that threaten the sustainability of the planet (UNESCO, 2007). EfS aims to promote not only learners' knowledge and understanding of environmental and social issues but also to affect their attitudes, promote competencies that are needed to shape a sustainable future, and empower them to change their behavior and take action for sustainable development (UNESCO, n.d.). EfS aims to build an adaptable workforce with higher-order thinking skills and a civil capacity for community-based decision-making, social tolerance, and environmental stewardship to enhance the quality of life (UNESCO, 2007).

Several international conferences have promoted this educational initiative. Prior to the Rio summit in 1992 these initiatives

were addressed as environmental education and the main focus was conservation. Since then the focus has shifted to cover social issues and the mutual relationship between environmental, economic, and social processes. Scholarly literature is divided about the "correct" terminology and the extent to which this terminology actually reflects different foci. Currently the terms being used to describe educational initiatives regarding the relationship between humans and the environment include environmental education (EE), education for sustainable development (ESD), environmental education for sustainability and education for sustainability (EfS). Our opinion which is supported by other scholars (Sauvé, 2005; Stevenson, 2006) is the main problems, from a practical point of view are in the implementation of all the above rather than with definition. Herby we use the term EfS, which is vastly used in Israel, where this study took place.

Unlike EfS in K-12 education, that continues and further develops environmental education, EfS in higher education (HE) has only recently emerged as a field. Most of the initiatives occurred in the last two decades, following the Rio earth summit in 1992, and Agenda 21 (Beringer Adomßent, & Scott, 2008; Beringer & Adomßent, 2008). HE institutions are regarded as essential in promoting sustainable development since today's students are tomorrow's professionals, decision makers and consumers (Cortese, 2003; Orr, 1995; Rowe, 2002). Sustainable development is considered as one of the most crucial and important challenges for humanity in the 21st century, and therefore EfS is relevant not only to students who major in environmental studies but to all students in HE institutes.

Abbreviations: EfS, education for sustainability; SLO, learning outcomes that promote sustainability.

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Designing any educational program should include identifying desirable learning outcomes and planning educational activities that will promote them. It is often recognized that the discussion of learning outcomes improves the learning processes as well, and it is advocated that student assessment should indicate whether these outcomes are achieved (Svanström, Lozano-Garcia, & Rowe, 2008). The aims of this study were twofold: (a) to develop a theoretical and practical framework for assessing learning outcomes that promote sustainability (SLO); and (b) to use the framework in higher education courses to address the following research questions:

1. What are the reported SLO of the students and the patterns of SLO?
2. Is there a difference between the patterns of SLO in the various courses?

The idea of sustainability is rather new in higher education, and in the institution we studied we could not identify many courses that explicitly taught about sustainability. Consequently, we studied courses that according to their instructors “dealt with environmental issues”. We were interested in the extent to which these courses have enhanced knowledge, skills and affective attributes that are required in order to promote sustainability.

Many theoretical discussions deal with how EfS in HE should be designed, and many examples of specific EfS courses and programs exist worldwide, yet, findings of large scale studies in higher education revealed that the formal course work did not have an impact on most students’ knowledge and attitudes regarding environmental and sustainability issues (Azapagic, Perdan, & Shallcross, 2005; Kagawa, 2007; Yavetz, Goldman, & Pe’er, 2009). Therefore, it has been suggested that environmental issues and ideas about sustainability should be integrated into a larger number of courses. To the best of our knowledge, the questions of whether a course that conveys environmental concepts actually deals with broader environmental issues and with the idea of sustainability is not yet studied. Moreover, there is not enough attention to what makes a course that integrates environmental issues and ideas a significant learning experience in term of SLO.

Defining the learning outcomes of EfS in higher education

It is often claimed that there is no single framework, conceptualization, and understanding of sustainability (Kagawa, 2007), and therefore, scholars conceptualize EfS learning objectives differently. This should be considered when developing an assessment scheme for EfS; however, we believe that some basic principles should be addressed while looking at EfS programs in HE. The question on hand is what should be those principles. In the following section we describe various learning outcomes, focusing on two main aspects: *types of psycho-social outcomes* (knowledge, affect, and skills), and *spheres of life* (private, civic and professional). We suggest that any attempt to design EfS in HE should address these two aspects.

Multiple psycho-social learning outcomes

Since the first international conferences on environmental education, UNESCO’s publications have pointed to the need for multidimensional learning outcomes, and addressed the need for enhancing student knowledge, attitudes, and skills that are essential for the promotion of sustainable ways of life (UNESCO, 1977, 1992, n.d.). The acknowledgment of learning goals that address knowledge, affect and skills is apparent as well in the literature on EfS in HE in the last decade (Segalàs, Ferrer-Balas, Svanström, Lundqvist, & Mulder, 2009; Sipos, Battisti, & Grimm,

2008; Svanström et al., 2008). Following this view, scholars in the field suggest that educational programs in HE should be designed in a way that addresses all domains of learning rather than focusing on knowledge acquisition (Segalàs et al., 2009; Sipos et al., 2008). Sipos et al. suggest that the integration of all three domains will promote the development of a fourth domain – behavior, which they point to as the ultimate goal of transformative learning. This idea is in line with UNESCO’s definition of EfS as an education that empowers learners to change their behavior and take action for sustainable development. It is also in line with research in the field of environmental psychology about the factors that shape pro-environmental behavior. The term pro-environmental behavior is a general expression that includes several different behaviors, such as private sphere behavior (recycling, consumerism), and public sphere environmental activism (Stern, 2000). The direct antecedent of behavior is behavior intention (Bamberg & Möser, 2007). Education and psycho-social factors might shape the intentions, but the link between intentions and actions depends on many other situational factors and barriers, such as financial considerations and governmental incentives (Bamberg & Möser, 2007; Kollmuss & Agyerman, 2002). A major and important recurring research finding is that knowledge on environmental issues is important but is not enough to develop pro-environmental behavior (Hungerford & Volk, 1990; Kollmuss & Agyerman, 2002). Affective variables and perceived skills were found to have significant connections to the development of intentions to act pro-environmentally. These findings influenced the development of theoretical models that view intention to act in pro-environmental ways as a product of three kinds of antecedents: cognitive, affective, and actual or perceived skills (Bamberg & Möser, 2007; Hungerford & Volk, 1990; Kollmuss & Agyerman, 2002).

It is worth noting that while sustainable development deals with the relationships between environmental, social and economic processes, the literature focuses more on the environmental aspects of sustainability than on the others. We assume this is because the environment in general and environmental education in particular are longer established than the newer idea of sustainability in general and sustainability literacy or education for sustainability in particular. Sustainability literacy requires the integration of skills, attitudes, competencies, dispositions and values that are necessary for the promotion of a sustainable world (Stibbe & Luna, 2012). This complexity is in line with the above mentioned ideas regarding the multidimensionality nature of LO in EfS. According to Stibbe and Luna, as people become sustainability literate, they are empowered to read society critically, discover insights into unsustainable trajectories, and get involved in the re-writing of self and society along more sustainable lines (Stibbe & Luna, 2012, p. 11).

Specific psycho-social learning outcomes. Besides the need for integrating different domains of learning, there are several specific outcomes that were identified as important when educating for sustainability in HE.

Knowledge of sustainability issues. By definition, EfS deals with the well-being of all three realms of sustainability – environment, society, and economy (UNESCO, 2007). Several topics are considered as central in EfS programs; teaching about biodiversity and climate change for example are such topics. Yet, while some undergraduate courses aim to present a more holistic perspective of sustainability and cover many topics, others teach a specific topic in depth. Therefore when one wishes to assess knowledge no fixed set of items could be sufficient.

Skills. Promoting sustainable development is a challenging task, which demands various competencies such as having the ability to deal with ill-defined problems, and with conflicting interests of different stakeholders. To cope with such challenges future

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