Integrating sustainability in higher education: a generic matrix

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Abstract

Purpose – The purpose of this paper is to develop a framework in the form of a generic matrix of options for integrating sustainability in higher education (SHE) so that university faculty and administrators can make more appropriate and strategic choices with respect to SHE.

Design/methodology/approach – This original matrix draws from and extends previous empirical and conceptual research on integrating SHE. The paper addresses the needs and weaknesses stated in earlier literature on SHE.

Findings – The matrix includes four different options or scenarios for integrating SHE; these options are based on delivery of SHE and focus of SHE. Advantages and disadvantages of each option are discussed, as well as rationales for choosing each option. In addition, suggestions for future research are included.

Practical implications – The matrix can provide a platform from which to launch discussions about SHE, as well as a template with respect to "how to" integrate SHE.

Originality/value – This original matrix contributes to the literature by providing a broad, non-discipline-specific orientation; it is applicable at course, program, and cross-disciplinary/cross-university levels, and can be applied internationally. Users can move between and among options, and can implement multiple options simultaneously. Further, the matrix includes all dimensions of sustainability – environmental, social, and economic/financial.

Keywords Sustainable development, Higher education, Curricula

Paper type Research paper

Introduction

Sustainability is a major issue for all organizations in the twenty-first century. Increasingly, corporations are being encouraged or required to address sustainability by boards, stockholders, and other stakeholders – and are exploring and implementing sustainable practices to improve both the environment and their own competitiveness (Rusinko, 2007). At the same time, institutions of higher education are exploring means to integrate sustainability into curricula (Cusick, 2009; Rusinko and Sama, 2009).

Over the past several years, there have been a growing number of studies on how to integrate sustainability in higher education (SHE). Some of the more recent studies include Benn and Dunphy (2009), Lidgren *et al.* (2006), Lozano (2006), Roome (2005), Sammalisto and Lindhquist (2008), and Scott and Gough (2006). Several of these studies tend to be case-oriented, and/or focused on an individual course, program, or institution (Benn and Dunphy, 2009; Lidgren *et al.*, 2006; Roome, 2005; Sammalisto and Lindhquist, 2008). In this, the United Nations Decade of Education for Sustainable Development (2005-2014), there seems to be a relative shortage of broader, more general frameworks

for integrating sustainability into curricula in higher education (Sammalisto and Lindhquist, 2008); therefore, that is the focus of this paper.

This paper presents a generic matrix of options with respect to how to integrate sustainability in curricula in higher education. The matrix is applicable at course, program, and cross-disciplinary/cross-university levels; users can include faculty and administrators. The matrix is flexible in that users can move between and among options, and can implement multiple options simultaneously. Users can start at whichever option (or quadrant) is most comfortable and appropriate for them with respect to integrating sustainability into their curricula. While many of the examples focus on a business school and how it can integrate sustainability both internally and beyond school boundaries, the matrix is applicable to all curricula in all universities, and can be applied internationally. This type of matrix is consistent with perspectives and recommendations by researchers in SHE such as Lingren *et al.* (2006), Sammalisto and Lindhquist (2008), and Scott and Gough (2006), in that it uses a broad focus (rather than a specific example); it includes dimensions of sustainability beyond that of the environment – including environmental, social, and economic/financial – and it presents faculty and administrators with multiple options for integrating SHE. The matrix allows faculty and administrators to be more strategic in choosing the best options for integrating sustainability into their curricula, relative to their desired outcomes and resource constraints. In addition, this type of generic matrix can provide a framework for future research on effectiveness of various options with respect to integrating SHE. (Please note that the issue of the sustainability canon itself, or content for sustainability education (Sherren, 2007), is not part of the scope of this paper. Likewise, learning outcomes with respect to sustainability education are not within the scope of this paper. The matrix itself focuses on curricula (rather than operations).)

While there are multiple definitions of sustainability, for the purposes of this paper, sustainability will be defined in a manner consistent with one of the most cited definitions, that of the Brundtland Commission. That is, sustainability refers to that which "[. . .] meets the needs of the present generation without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987, p. 8). Consistent with other researchers (Kagawa, 2007; Venkataraman, 2009), sustainability is defined in terms of three dimensions: environmental, social, and economic/financial. Examples of environmental sustainability include efforts to conserve and reuse. Examples of social sustainability include efforts to promote equity, diversity, and social justice. Examples of economic sustainability include efforts to reduce poverty and promote fair trade. There is overlap between and among these dimensions of sustainability (Scott and Gough, 2006). According to the UNESCO (2004), sustainability education must address all three parts of sustainability – social, environmental, and economic – because this allows all people to develop the necessary skills, knowledge, and perspectives to make decisions to improve quality of life at all levels.

Background and literature
The matrix developed in this paper helps faculty and other decision makers in higher education to determine their best alternatives, and hence, make more strategic decisions about integrating SHE. This paper contributes to the literature by extending previous studies and perspectives with respect to how to integrate SHE, including Lozano (2006),

Lidgren *et al.* (2006), Roome (2005), Sammalisto and Lindhquist (2008), and Scott and Gough (2006). These researchers contributed the context and constraints of SHE that informed the development of the generic matrix presented in this paper. For example, Sammalisto and Lindhquist (2008) emphasized the need for a broad, general approach to SHE. Scott and Gough (2006) concluded that the dimensions of sustainable development (e.g. environmental, social, and economic) should be viewed simultaneously, and not separately – and likewise for teaching sustainability. Lidgren *et al.* (2006) and Scott and Gough (2006) address the need to think strategically about integrating sustainability into higher education. Lozano (2006) recommends an incremental approach with respect to SHE, whereby small groups can start out, and if successful, can expand SHE throughout the university. Roome (2005) addresses the need to include multiple academic stakeholders, and stakeholders outside of the academic environment, with respect to integrating sustainability into curricula in higher education. Additional links to SHE research will be established in the sections below, which explain the generic matrix for integrating sustainability into higher education curricula, and how to use it.

A generic matrix of options for integrating SHE

To attempt to integrate SHE, it is necessary to address how it should be implemented or delivered; that is, through already existing structures, or by creating new structures (Sammalisto and Lindhquist, 2008). For example, sustainability can be integrated into higher education through an already existing structure such as a course – as a new topic, case, or module. Likewise, sustainability can be integrated into higher education by creating a new structure, such as a new course, major, or program. Currently, there is debate over whether sustainability should be integrated into existing courses or taught as stand-alone courses (Christensen *et al.*, 2007; Tilbury *et al.*, 2004). Advantages and disadvantages of both approaches will be discussed in the next section.

In attempting to integrate SHE, it is also necessary to address the focus; that is, a narrower or discipline-specific focus, or a broader or more cross-disciplinary focus (Lozano, 2006). For example, sustainability can be integrated into higher education with a narrower focus, with respect to an individual program or school. Sustainability can also be integrated into higher education with a broader focus, with respect to cross-disciplinary or university-wide requirements. The generic matrix of options for integrating SHE is shown in Figure 1.

The upper left quadrant, or Quadrant I, represents integration of SHE within existing structures and through a narrower, more discipline-specific focus. Illustrations of this type of decision include integrating sustainability into an already existing course in management as a new topic, case or module (Rands, 2009), or by integrating sustainability topics into selected courses in an MBA Program at University of Technology in Sydney, Australia (Benn and Dunphy, 2009). Likewise, sustainability topics could be integrated into any other (non-business) discipline.

The lower left quadrant, or Quadrant III, represents integration of SHE within existing structures, but through a broader, cross-disciplinary focus. Illustrations of this type of decision include integrating sustainability into one or more common core course requirements across the university.

The upper right quadrant, or Quadrant II, represents integration of SHE through a narrower, more discipline-specific focus, but through creating a new structure.

SHE delivery

Existing structures   New structures

	I. Integrate into existing course(s) minor(s), major(s), or programs(s)	II. Create new, discipline-specific sustainability course(s), minor(s), major(s) or programs(s)
	III. Integrate into common core requirements	IV. Create new, cross-disciplinary sustainability course(s), minor(s), major(s), or programs(s)

SHE focus

Narrow (discipline-specific)

Broad (cross-disciplinary)

Figure 1.
General matrix to
integrate SHE

Illustrations of this type of decision include creation of a stand alone course in sustainability and business, or creation of discipline-specific minors, majors, or concentrations in sustainability. The creation of a Bachelor's Degree in Sustainable Business by Aquinas University in Grand Rapids, Michigan, USA, is an example of this approach, and so are the minors in Sustainable Business created by schools including University of California, Irvine, USA, and University of New Mexico, USA.

The lower right quadrant, or Quadrant IV, represents integration of SHE through new structures, but with a broader, cross-disciplinary focus. An illustration of this type of decision is creation of a new, cross-disciplinary introductory or capstone course in sustainability. Likewise, the sustainability and supply chain residency, a part of the Global ONE MBA Program, which is offered by five different universities in five different countries, is an example of this boundary-spanning option to integrate SHE (Roome, 2005).

Using the matrix
The matrix is flexible in that users can move from one quadrant to another, and can select one or multiple quadrants (or options) with respect to integrating SHE. In addition, users can start at whichever quadrant is most comfortable and appropriate for them with respect to integrating sustainability into their curricula. First movers or individual faculty champions might start in Quadrant I, the upper left quadrant, by integrating sustainability into an already existing discipline-specific course in the form of a new topic, case, or module. That is, sustainability would be presented in a way that is consistent with the course description, content, and outcomes. For example, a case on sustainability in the supply chain may be used in an operations management course. Or, a project to track threatened turtle species and their habitat may be used in a biology course. This option is usually undertaken by faculty member(s) who are first movers, and feel strongly about the importance of SHE, but committed administrators may also solicit faculty participants. (However, opinions can differ with respect to the "easiest" first move for integrating SHE; Sterling (2004) holds that first movers often create a new, stand alone course in sustainability, which is a process he calls "bolting on." On the other hand, while it can be argued that a dedicated, stand-alone course may be easier to deliver

than a module in an existing course (since sustainability is the entire focus of a dedicated course, rather than one of the topics within a discipline-specific course), a stand-alone course typically demands significantly more knowledge about sustainability, as well as administrative support.)

A major advantage to an option in Quadrant I is that it does not require review, coordination, or support beyond that of the involved faculty member(s), and resource demands are relatively modest. The disadvantage is that the application is limited to the involved faculty member(s) and their particular course(s)/section(s). Eventually, given faculty and administrative support, it may be possible to integrate the sustainability case into all sections of a particular course – and it may be possible to integrate sustainability into multiple existing courses within a program, as was the case with the MBA Program at University of Technology in Sydney, Australia (Benn and Dunphy, 2009). However, sustainability will ultimately be limited to a portion of a discipline-specific course or courses. (It is interesting to note that Holt (2003) indicates that this type of approach (discipline-specific modules integrated into existing courses) has a greater impact on business students than separate courses on sustainability.) The option in Quadrant I can be adopted by motivated users, with limited resources and administrative support with which to integrate SHE.

At the same time, that faculty are integrating SHE through Quadrant I, faculty and administrators can address Quadrant II, by developing new, discipline-specific sustainability courses. For example, a course in Sustainability and Business may be developed within a business school. Likewise, a number of course,s may be developed to form a minor or major in sustainable business within a business school (e.g. Economics of Sustainability; Management of Sustainability, etc.). (While one or more of the courses in a sustainable business minor or major may be outside of the discipline, the focus on sustainability is still largely specific to the business discipline; therefore, these minors and majors can be largely classified under Quadrant II.) Correspondingly, a course in sustainable architecture may be developed in an architecture school and/or a number of course,s may be developed into a minor in sustainable architecture.

The advantage of this approach is that sustainability has its own identity, and its own separate course(s) within the discipline(s). It allows the discipline(s) to be distinguished as leaders with respect to SHE. In the event that one or more of the courses is/are required, sustainability will be integrated uniformly within the discipline. Of course, multiple disciplines may address this option simultaneously. The major disadvantage of this approach is that it demands significant time, resources, and cooperation by faculty and administrators throughout the discipline, and at higher levels in the university. In addition, this approach can isolate sustainability, particularly in the case of stand alone electives. According to Shriberg (2002), sustainability electives are necessary; however, sustainability education needs to be incorporated into the core curricula and courses. This option would be adopted by users with some time, resources, and commitment to integrate SHE; these users would include faculty and administrators within the discipline, and at higher levels of the university. Users who want to establish a distinctive competence with respect to discipline-specific SHE would adopt this option.

While the options in Quadrants I and II can be adopted by users at the level of the individual course or discipline, Quadrants III and IV are adopted by users with a cross-disciplinary focus – which typically requires adoption at the university level. (However, both narrower and broader approaches to integrating sustainability into

curricula can be pursued simultaneously.) Users who would adopt the option in Quadrant III might integrate sustainability into existing courses common to more than one discipline, or into the common core requirements across the university. That is, sustainability would be integrated into some common courses taken by engineering and science students, or integrated into all of the liberal arts core requirements, so that a relatively large number of students (or all students) would be exposed to sustainability. This could be done through introduction of sustainability as a topic, or through cases, modules, or service learning components in the courses. For example, writing and communication courses required for all students might explore the topic of sustainability.

The advantage of this option is that sustainability is integrated across multiple disciplines, or across the entire curriculum, and a larger number (or all students) are exposed to sustainability. The major disadvantage is that it demands a university-wide commitment with respect to time, resources, and support. This option would be adopted by a university for whom integrating sustainability across the curriculum is a priority.

At the same time, that a university is pursuing the option(s) in Quadrant III, it can also be pursuing options in Quadrant IV, by developing a stand-alone, cross-disciplinary course, or a capstone course required for all students. Or, Quadrant IV can be pursued through development of cross-disciplinary or trans-disciplinary sustainability programs, majors, or minors. While a cross-disciplinary perspective involves two or more disciplines, a trans-disciplinary perspective involves moving beyond academic disciplines to include stakeholders such as organizations, customers, citizens, etc. (Lozano, 2006). For example, the Sustainability and Supply Chain Residency is part of the Global One MBA, which is trans-disciplinary. This MBA program involves five different universities in five different countries, as well as non-academic stakeholders (Roome, 2005). Another example of a trans-disciplinary approach is a Regional Center for Excellence (RCE) (Leal Filho and Schwarz, 2008); typically, stakeholders include universities, government, business, and others. According to Leal Filho and Schwarz (2008), the recently developed RCE Hamburg is a hub to promote education for sustainable development in the region of Hamburg, Germany.

The advantage of this option is that sustainability is integrated across two or more university disciplines, and can also include non-academic stakeholders. The disadvantage is that this option makes the greatest demands on resources and coordination, both throughout and beyond the university. This option would be adopted by a university for whom integrating sustainability across the curriculum and beyond is a strategic goal. Table I summarizes major advantages and disadvantages of each option or quadrant, as well as general circumstances under which each option is typically adopted.

The options in the matrix can be chosen in chronological order (by quadrant), or in any order, depending upon resource availability, desired outcomes, and expertise of faculty and administrators. It is not inconceivable that the choice of options can move backwards – e.g. from Quadrants III and IV to Quadrants I and II – depending upon an institution's resources and strategic focus (or lack thereof) with respect to sustainability and/or effectiveness of particular options in particular university environments.

In general, the greater the commitment to integrate sustainability into the curricula – in terms of more and/or new structures, and broader focus – the greater is the need for faculty resources and training in sustainability, as well as rewards for engaging in sustainability education and research. According to Beringer *et al.* (2008), the lack

Option/quadrant	Major advantages	Major disadvantages	When to use
I. Existing structures/ narrow focus	Ease of implementation Little need for admin. support Minimal resource demands	Limited and non-uniform integration of SHE	With motivated faculty and limited resources As an introductory/trial approach to SHE
II. New structures/ narrow focus	SHE has independent identity within discipline(s) More standardized approach to SHE within discipline(s)	Great resource demands than I Greater need for admin. support than I May isolate SHE	With greater resource commitment To distinguish discipline with respect to SHE
III. Existing structures/broad focus	SHE is cross-disciplinary within existing courses Large number of students exposed to SHE	Demands significant cross-disciplinary resources and admin. support	When SHE is a cross-disciplinary priority
IV. New structures/ broad focus	SHE has independent identity across disciplines Large number of students exposed to SHE	Greatest demands on resources and admin. support	When SHE across the university (and beyond) is a strategic goal

of such rewards is well known in SHE, and is often cited by faculty as a reason for lack of commitment to SHE, in favor of more traditional disciplines that carry a higher probability of promotion, tenure, and other rewards.

The matrix as a research tool for SHE

At this time, research on practices, contingencies, and outcomes with respect to integrating sustainability into higher education is in its infancy (Sammalisto and Lindhquist, 2008). Therefore, questions about which practices are best practices with respect to integrating SHE remain largely unanswered. However, this matrix can provide a platform for future research. For example, the matrix generates questions such as, "Under what conditions are existing structures most effective for integrating SHE, and under what conditions is it most effective to create new structures?" In addition, "Are there conditions under which a combination of both delivery systems (existing structures and new structures) is most effective?" Similar questions can be asked with respect to a narrower, discipline-specific focus for integrating SHE, vs a broader, cross-disciplinary focus. The variables in the matrix can be further tested with respect to various contingencies and demographics of particular universities, disciplines, programs, courses, faculties, resources and support, and sustainability philosophy/mission. Equally importantly, this matrix can provide a platform from which to launch discussions on the role of sustainability in individual departments and across the university.

Thus, far, there is some suggestion that sustainability modules integrated into discipline-specific courses are "more important" in business schools than are separate courses (Holt, 2003). This finding is contrary to practice in many universities, which tends to take the form of developing separate sustainability courses, rather than linking sustainability to a particular field of study (Beringer *et al.*, 2008). With respect to SHE in Atlantic Canada, Beringer *et al.* (2008) report that the best performers tend to be "primarily undergraduate" institutions that are known for their commitment to high-quality undergraduate education in the region. While these findings may be limited in their generalizability, they provide a starting point for future research.

Some problems with current research on SHE include weak linkages between plans and practices (e.g. early adopters with ambitious plans that fail to be realized), and offerings that focus mainly on the environmental dimension of sustainability (Segalas *et al.*, 2004). In addition, there is the problem of how to operationalize variables and outcomes (Sammalisto and Lindhquist, 2008). Other researchers have cited problems including lack of administrative commitment to integrating sustainability into higher education, and limited time and resources (Lidgren *et al.*, 2006; Sammalisto and Arvidsson, 2005). While existing data on integrating sustainability into higher education may not be conclusive, the field of research is evolving, and as it continues to do so, this generic matrix can be used to guide research.

Conclusion

This paper has drawn from and extended previous research and recommendations from the SHE literature in order to develop and present a matrix of options with respect to integrating SHE. Contributions of the matrix include use of a broad, non-discipline specific perspective – including delivery and focus considerations – so that faculty and administrators can make the appropriate and strategic choices with respect to integrating sustainability into higher education, given their particular goals, resources,

and environment. Discussion and illustrations include major advantages and disadvantages of each option, and general suggestions for when to use each option.

The matrix is extremely flexible with respect to applications. While many of the examples address a business school and how it can integrate sustainability both internally and beyond school boundaries, the matrix is applicable to all curricula (as illustrated by a few non-business applications throughout), and can be applied internationally. Hence, unlike much of the current SHE literature, the matrix is non-discipline specific, and is applicable at course, program, and cross-disciplinary/cross-university levels. Users can move between and among options, and can implement multiple options simultaneously. Further, the matrix focuses on all dimensions of sustainability – environmental, social, and economic – rather than focusing only on the environmental dimension. In addition, the matrix provides a platform for discussion of the role of sustainability at department and university levels, as well as a framework for future research on effectiveness of various options with respect to integrating SHE.

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