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The Sustainable Human and Environmental Systems Approach to Sustainability Education: Foundational Principles, Pedagogical Strategies, and Administrative Considerations

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Abstract: Since 2009, the Sustainable Human and Environmental Systems (SHES) Roundtable has been a collaborative forum for college and university faculty and administrators, practitioners, and others from throughout North America and beyond to pursue their commitment to providing students with the knowledge and skills needed to meet the existential sustainability challenges that plague the modern world. The result has been the SHES approach to sustainability education—a living set of recommendations about the pedagogy and administration of interdisciplinary and higher-order, sustainability-focused programs in higher education. The Roundtable's edited book—*Education for Sustainable Human and Environmental Systems: From Theory to Practice* (Routledge, 2019)—is the most comprehensive summary of the Roundtable's first decade of work. The SHES approach to sustainability education is rooted in a vision, a mission, and a strategic goal. The essence of the SHES vision is a world of sustainable societies. The essence of the SHES mission is to sustain the viability of the human and environmental systems and interactions among those systems on which the realization of the vision depends. The essence of the SHES strategic goal is to bring about and to sustain the types of social learning needed to fulfill the mission. The SHES approach to sustainability education rests on six foundational principles: holism, supradisciplinarity, systems thinking, revealed complexity, social learning, and stakeholder engagement. Although the SHES approach is compatible with many pedagogical strategies, some of them are natural allies in achieving its learning outcomes. They include competency-based education (if properly conceived), backward design, the flipped classroom, project-based learning, and the Socratic method. The SHES approach to sustainability education also is suitable for use in any institutional setting. Yet, certain administrative considerations are likely to warrant special attention when building a SHES-based degree program. They include supporting SHES faculty, supporting SHES program design, and broader institutional support and recognition for the SHES approach.

Keywords: Education, environmental systems, human systems, sustainability, holism

Introduction

Since 2009, the Sustainable Human and Environmental Systems ("SHES") Roundtable has been a collaborative forum for college and university faculty and administrators, practitioners, and others from throughout North America and beyond to pursue their commitment to providing students with the knowledge and skills needed to meet the existential sustainability challenges that plague the modern world. The result has been the SHES approach to sustainability education. The SHES approach is a living set of recommendations about the pedagogy and administration of interdisciplinary and higher-order sustainability-focused programs in higher education. The

Roundtable's edited book—*Education for Sustainable Human and Environmental Systems: From Theory to Practice* (Focht et al., 2019)—is the most comprehensive summary of the Roundtable's first decade of work. The SHES approach embraces the education not only of students per se but also of stakeholders and whole societies as a prerequisite for success in transforming a world of unsustainable societies into a world of sustainable ones (see Focht & Barresi, 2019, p. 62).

I. Foundational Principles

"Sustainability," like "sustainable development," is a contested term and concept (compare, e.g., Salas-Zapata & Ortiz-Muñoz, 2019, with, e.g., Kates et al., 2005). One of the consequences of the ongoing debate over the meaning of the term and concept is that defining the scope of a "field of sustainability" is a problematic endeavor at best (cf. Reiter et al., 2012, p. 109). For that reason, the SHES Roundtable abandoned its early efforts to define "sustainability" as a term and concept in favor of articulating the goal of the corresponding academic domain (see Reiter et al., 2011, p. 66), which is the emergence of sustainable societies, and then to flesh out the meaning and implications of that concept in a rigorous way. The result is a vision, a mission, and a strategic goal. The essence of the SHES vision is a world of "sustainable societies," defined as societies that "facilitate enhance, and sustain indefinitely in that facilitated or enhanced state the well-being of human individuals, their communities, and their environments" (Focht & Barresi, 2019, p. 62). The essence of the SHES mission is to sustain the viability of the human and environmental systems and interactions among the systems on which the realization of the vision depends (Focht & Barresi, 2019, p. 63). At a minimum, doing so requires maintaining the structural integrity, functional utility, adaptive capacity, and resilience of the systems and the number and diversity of their interactions (Focht & Barresi, 2019, p. 63). The essence of the SHES strategic goal is to bring about and to sustain the types of social learning needed to fulfill the mission (Focht & Barresi, 2019, p. 63). Social learning in this context is a society-wide process in which individuals learn from each other and behave accordingly, especially but not exclusively in their activities at the human-environment interface, in ways calculated to transform unsustainable societies into sustainable ones and to maintain them as such (cf. Focht & Barresi, 2019, p. 63).

These aspirational goals imply a formidable educational challenge: How should degree programs in colleges and universities be designed and delivered to prepare students to contribute to the transformation of unsustainable societies into sustainable ones, the viability of the human and environmental systems on which the sustainability of those societies depend, and the social learning needed to ensure that those systems remain or become and then remain viable ones? The SHES approach to sustainability education has many attributes essential to meeting this challenge. Yet, six thematic principles stand out: holism, supradisciplinarity, systems thinking, revealed complexity, social learning, and stakeholder engagement.

Holism

The lived experience of societies worldwide has made clear that reductionist perspectives on the world are ill-suited to grappling with the complexity of the circumstances that make societies unsustainable. Therefore, those perspectives are also ill-suited to the task of transforming unsustainable societies into sustainable ones. Holistic perspectives—which, by definition, recognize the crucial role of the complexity of wholes in making them what they are—are needed instead. For that reason, degree programs in colleges and universities that aspire to graduate students with the knowledge and skills needed to contribute to the transformation of unsustainable societies into sustainable ones must foster these holistic perspectives (see Focht & Barresi, 2019, pp. 64, 77). This pedagogical imperative implies the value of supradisciplinarity.

Supradisciplinarity

The principle impediment to fostering the holistic perspectives needed for graduates of degree programs in colleges and universities to contribute to the transformation of unsustainable societies into sustainable ones are the reductionist perspectives inherent in discipline-based thinking. These perspectives began to crystallize in the West some five hundred years ago and, since then, have spread around the world. The SHES approach to sustainability education embraces supradisciplinarity as a remedy (see Focht & Barresi, 2019, p. 77). The layering of discipline-based perspectives into a cognitive sandwich does not offer a holistic perspective on the world. Cross-disciplinary cognitive lenses that recognize disciplinary boundaries—whether through the juxtaposition of disciplines (multi-disciplinarity), the intersection of disciplines (trans-disciplinarity), the overlap of disciplines (pluri-disciplinarity), or the union of disciplines (interdisciplinarity)—are not much more useful because they retain discipline-based concepts and methods, with the overlap or union of disciplines nevertheless being marginally better than the other approaches (see Reiter et al., 2011, pp. 64–65; Reiter et al., 2012, pp. 111–12; Reiter & Smardon, 2019, pp. 229–30). Supradisciplinarity

achieves cognitive holism by transcending disciplinary boundaries entirely. In the SHES approach to sustainability education, systems thinking plays a crucial role in this process.

Systems Thinking

The SHES approach to sustainability education recognizes that the most useful way to conceptualize education for sustainability is as the study of the interrelations of human and environmental systems on Earth. The SHES approach recognizes that the distinction between these two types of systems—and, thus, the location of the interface along which their interactions occur—is often unclear. Sometimes, the best that can be said about the world in which we live is that it is a dynamic amalgam of elements of human and non-human systems that together form an integrated supersystem of global dimensions. Notwithstanding these challenges, the SHES approach relies on systems thinking as a core holistic thinking strategy (see, e.g., Focht & Barresi, 2019, pp. 64–65, 66, 68, 69) but not necessarily the only one (cf. Barresi, 2019, pp. 104–05). Its principal task is to reveal the complexity of circumstances that are inconsistent with a sustainable society, which is the hallmark of the SHES approach (see Focht & Barresi 2019, pp. 64–65, 68–69, 70–71, 77).

Revealed Complexity

At the core of the SHES approach to sustainability education is the use of systems thinking to reveal the complexity of circumstances that are inconsistent with a sustainable society as a substitute for the reductionist perspectives inherent in discipline-based thinking (Focht & Barresi, 2019, p. 64, 65). *Complexity* in this context is the number and diversity of the elements of a given phenomenon (Focht & Barresi, 2019, p. 65). The SHES approach is designed to reveal both systemic and interactional complexity. *Systemic complexity* is the number and diversity of systems that make a given phenomenon what it is (Ibid.). *Interactional complexity* is the number and diversity of the interactions among those systems that make the phenomenon what it is (Ibid.). The SHES approach uses the same strategy to envision alternatives to circumstances that are inconsistent with a sustainable society as well as viable means of transforming the one into the other (Focht & Barresi, 2019, pp. 64, 65, 77). Thus, the SHES approach maintains a supradisciplinary—and, thus, holistic—perspective on the current circumstances or future alternative of interest while gradually revealing its complexity in systems thinking terms (see Focht & Barresi, 2019, pp. 68–73, 75; see also Barresi, 2019, pp. 108–16). It also conceptualizes societies as self-organized, holarchic, and open systems of human relationships in which the social learning that is the strategic goal of the SHES approach occurs (Focht & Barresi, 2019, pp. 63–64).

Social Learning

Social learning is the strategic touchstone for the SHES approach to sustainability education because it is the only way of ensuring that unsustainable societies can be transformed into societies that can be sustained indefinitely.[1] Social learning entails observing others' behavior and then adopting that behavior as one's own (Focht & Barresi, 2019, p. 63). This process has an emotional dimension, which shapes how people interpret social reality (Ibid.). One result is that the behavioral change that results from social learning is merely the most visible manifestation of the transformation of sociocultural norms and practices (see ibid.). It is this transformation that the SHES approach intends to provide the principal motivation for individuals, communities, and whole societies to work together to achieve the SHES vision of a world of sustainable societies (Focht & Barresi, 2019, p. 77). In any given set of circumstances that are inconsistent with a sustainable society, it is the stakeholders who are the most important potential contributors to or detractors from this work. For that reason, the SHES approach puts special emphasis on stakeholder engagement.

Stakeholder Engagement

Stakeholders figure prominently in the SHES approach to sustainability education, as they must in any approach to education that seeks to foster the transformation of unsustainable societies into sustainable ones. For example, it is the stakeholders who decide which current circumstances are of concern because they seem to be inconsistent with a sustainable society (see Focht & Barresi, 2019, p. 64). It is the same stakeholders whose valuation of systems and interactions among those systems for their contributions to well-being ultimately validate that concern (see Focht & Barresi, 2019, pp. 63, 64, 65, 66, 67–68, 69). It is also the stakeholders who envision sustainable alternatives to current circumstances as well as the interventions that would be needed to transform the one into the other (see Focht & Barresi, 2019, pp. 73–75, 79). It is also the stakeholders who ultimately will bring those interventions about (see Focht & Barresi, 2019, p. 75). One result of this process is social learning, in which stakeholders play a pivotal role (see

[1] For much more on social learning and the SHES approach to sustainability education, see Morrison et al., 2019.

Focht & Barresi, 2019, pp. 63–64, 75; see also ibid., p. 77). Thus, the SHES approach to sustainability education contemplates engagement with the stakeholders throughout its many steps. In the field, it is the stakeholders per se who serve in that capacity; in the classroom, students must act as proxies for the stakeholders (cf., e.g., Focht & Barresi, 2019, p. 66).

II. Pedagogical Strategies

Almost from the start, the Roundtable intended the SHES approach to sustainability education to be universally applicable, regardless of institutional or subject matter context (see Reiter et al., 2011, pp. 61, 66, 70, 73; Reiter et al., 2012, pp. 109, 113, 116; Reiter & Smardon, 2019, pp. 232, 236). As a result, the SHES approach is suitable for use not only with students enrolled in academic or pre-professional courses and programs in colleges and universities large and small but also by stakeholders and practitioners in the field. The SHES approach is also inherently well suited for use across a full spectrum of courses and programs—not just in stand-alone "sustainability" courses and programs but also in others as a complement to content defined by reference to discipline-based criteria, such as environmental science or studies, political science or sociology, or business administration. Notwithstanding this complementarity, the SHES approach does have essential learning outcomes of its own (see Table 1).

Category	No Evidence	Beginning	Developing	Accomplished
Holistic Thinking	Cannot distinguish parts from a whole	Can identify some parts and interactions within the whole	Can articulate how the relationships or interactions of the parts contribute to the whole	Can articulate how the complex relationships and interactions of the parts constitute the whole
Systems Thinking	Cannot identify systems conceptually	Can distinguish systems from non-systems based on their properties	Can resolve a system conceptually into a network of interacting subsystems, or can synthesize conceptually from a network of interacting systems a more inclusive super system	Can resolve a system conceptually into a network of interacting subsystems, and can synthesize conceptually from a network of interacting systems a more inclusive super system
Supradisciplinary Thinking	Cannot describe or explain phenomena without using discipline-based theories or methods	Can describe or explain simple phenomena without using at least one or the other of discipline-based theories or discipline-based methods	Can describe and explain simple phenomena using neither discipline-based theories nor discipline-based methods	Can describe and explain complex phenomena using neither discipline-based theories nor discipline-based methods
Complexity Thinking	Cannot distinguish between more and less complex sustainability situations or sustainable alternatives	Can distinguish between some complex sustainability situations or sustainable alternatives	Can distinguish between more and less complex sustainability situations and sustainable alternatives either qualitatively or quantitatively	Can distinguish between more and less complex sustainability situations and sustainable alternatives both qualitatively and quantitatively

Category	No Evidence	Beginning	Developing	Accomplished
Future Thinking	Cannot envision alternative futures and pathways to those futures	Can describe at least one of the following -- back casting, forecasting, visioning, or scenario analysis – as strategies for envisioning alternative futures and pathways to those futures	Can use at least one of the following -- back casting, forecasting, visioning, or scenario analysis -- to envision alternative futures and pathways to those futures	Can use back casting, forecasting, visioning, and scenario analysis to envision alternative futures and pathways to those futures
Diversity Thinking	Cannot recognize different stakeholder values or related perspectives on well-being	Can recognize some different stakeholder values or related perspectives on well-being	Can recognize different stakeholder values, related perspectives on well-being, and related claims	Can recognize different stakeholder values, related perspectives on well-being, and the need to resolve related conflicting claims
Collaboration	Cannot work on a team	Can work on a team	Can work on a team to accomplish a task	Can work inclusively on a team to accomplish a task
Stakeholder Engagement	Cannot articulate the value of stakeholder engagement	Can articulate the value of stakeholder engagement	Can identify the skills for stakeholder engagement that would contribute to moving society toward a sustainable future	Can demonstrate the skills for stakeholder engagement that would contribute toward moving society toward a sustainable future

Figure 1. The essential learning outcomes of the SHES approach to sustainability education. Source: Smardon et al., 2019, pp. 128–29 Table 8.1.

Certain pedagogical strategies are built into the SHES approach either explicitly or implicitly, although the boundaries between cognitive learning outcomes and the pedagogical strategies aimed at achieving them are not always clear (see Barresi, 2019)—nor need they be. Other pedagogical strategies stand out as natural allies of the SHES approach, although not necessarily the only ones. These allies include competency-based education (if properly conceived), backward design, the flipped classroom, project-based learning, and the Socratic Method. In many ways, these pedagogical strategies are also natural allies of each other.

Competency-Based Education

Competency-based education is a relative newcomer to postsecondary education, although its roots in primary and secondary education stretch back much further (see Nodine, 2016). Although it is possible to misconstrue the essence of competency-based education as job-training, there is nothing inherent in its pedagogy to require such a narrow focus. Nor would such a focus be very useful in the sustainability context, given the relative novelty, complexity, and dynamism of sustainability as a sole or complementary career path. In competency-based education, students progress through and out of a given course of study only by demonstrating mastery of the requisite competencies, which may be expressed in terms of either knowledge-based or skills-based learning outcomes. As a practical matter, these two types of outcomes are intertwined. A student cannot demonstrate the acquisition of knowledge without having acquired certain skills—even if those skills are merely reading, writing, and reasoning. Similarly, a student cannot demonstrate the acquisition of a skill without having acquired some knowledge about the context in which the skill must be demonstrated. The SHES approach to sustainability education is about preparing students to contribute in a meaningful way to meeting the challenge of transforming unsustainable societies into sustainable ones. Students

cannot do so if they merely understand this challenge but lack the skills to act on that understanding. The SHES learning outcomes, which emphasize the acquisition of skills—mostly cognitive skills but also collaborative and stakeholder engagement skills—are designed to equip students with the competencies needed to take the requisite action. For that reason, competency-based education is a natural ally of the SHES approach to sustainability education. By requiring students to demonstrate mastery of the requisite skills as the price for moving through and out of SHES courses and programs, competency-based education ensures that students will emerge from those courses and programs prepared to contribute to the transformation of unsustainable societies into sustainable ones.

Backward Design

Backward design emerged in the 1990s is an approach to curriculum development at both the course and the program levels (see Wiggins & Tighe, 1998). In a course or program developed using forward design, the articulation of the learning outcomes is the culmination of the design process. In course design, the choice of course materials, the structure of the syllabus, and other constituent elements of the course come first. In program design, the choice of courses and course sequences, the choice of faculty, and other constituent elements of the program come first. In both settings, the articulation of learning outcomes is the final step of the process. As a result, the content of those learning outcomes are constrained by all the other course or program design elements. In a course or program developed using backward design, the articulation of the learning outcomes is the first step of the process. All other elements of the course or program design flow from the content of the learning outcomes. Any approach to sustainability education that seeks to equip students with the knowledge and skills needed for them to contribute in a meaningful way to meeting the challenge of transforming unsustainable societies into sustainable ones is likely to benefit from backward design in the development of courses and programs alike. As a pedagogical strategy, backward design is much more likely than forward design to result in courses and programs that are focused like lasers on graduating student with the attributes needed for them to contribute to the transformation of unsustainable societies into sustainable ones. If those courses and programs are competency-based, then backward design is likely to be all the more effective in that regard.

The Flipped Classroom

The flipped classroom is a pedagogical strategy with a rich history at the secondary school level (see, e.g., Bergmann & Sams, 2012) that also has gained some traction in postsecondary education. In a traditionally structure classroom, class sessions are used primarily to provide students with information, often by means of a lecture. It is only after and outside class that students are asked to apply that information, albeit sometimes in a smaller class section that performs an auxiliary function, at least at the postsecondary level. A flipped classroom reverses the order of this process. Students acquired essential information on their own before and outside class, typically through readings of some kind. In class, they work with the instructor and each other to learn how to apply that information. The flipped classroom can be a very useful means of achieving both knowledge-based and skills-based course and program learning outcomes but especially those that are skills-based. As such, it is a natural ally of the SHES approach to sustainability education.

Project-Based Learning

Project-based learning is widely used in postsecondary education, including in sustainability contexts (see, e.g., Ab Wahid et al., 2020; Perraut & Albert, 2018). In this type of learning, students learn by doing by working on a practical project drawn from life for an extended period of time, typically in groups. In the process, students are required to deploy both knowledge and skills collaboratively in the service of the project goal. Because it not only evokes many of the features of the settings in which sustainability professionals typically work but also requires social learning, project-based learning is a natural ally of the SHES approach to sustainability education.

The Socratic Method

The Socratic Method is named for the ancient Greek philosopher Socrates, who first used it with his students nearly 2500 years ago. It is so effective in certain contexts that it has been used in various context in the Western world ever since. At the heart of the Socratic Method is the Socratic dialogue, in which the teacher asks the student a series of questions designed to lead the student along a path of inquiry. The point is to help the student to discover something for him- or herself. Thus, the Socratic Method is about revelation, not instruction. At the heart of the SHES approach to sustainability education is the use of holistic, supradisciplinary thinking to reveal complexity as a substitute for the reductionist perspectives inherent in discipline-based thinking. For that reason, the Socratic Method is a natural ally of the SHES approach to sustainability education.

III. Administrative Considerations

Although the Roundtable intended almost from the start that the SHES approach to sustainability education would be applicable in any institutional context, the adoption of a novel approach to education in courses and programs at any college or university is likely to pose novel administrative challenges. The adoption of the SHES approach is not likely to be an exception in that regard. In the SHES context, the administrative challenges are likely to fall into three categories: how to support SHES faculty, how to support SHES program design, and how to ensure broader institutional support and recognition for colleges and universities that incorporate the SHES approach into their curricula. With careful planning, patience, and some creativity, however, these challenges can be met.

Supporting SHES Faculty

The challenge of supporting SHES faculty is likely to play out differently in different types of colleges and universities. In particular, the very high degree of bureaucratization typical of large universities is likely to weigh more heavily on efforts to support SHES faculty than the more flexible institutional environments more common in smaller universities and colleges (cf. Pfirman et al., 2019, p. 223; Reiter et al., 2011, pp. 73–74; Reiter & Smardon, 2019, p. 236). This extreme bureaucratization usually extends to academic departments, which can be sealed off almost hermetically from one other. In the SHES context, the number and rigidity of institutional boundaries in highly bureaucratized environments is likely to have implications across a broad range of faculty support issues. Planning and implementing the recruitment of SHES faculty is likely to be harder in highly bureaucratized environments because of the need for coordination among many departments, divisions, or even schools (see Pfirman et al., 2019, pp. 218–19). The mentoring of SHES faculty is also likely to be a challenge, especially in the first few years after adopting the SHES approach, because of the absence of senior faculty members with similar supradisciplinary interests and skills (cf. Pfirman et al., 2019, p. 219). For the same reason, creating appropriate promotion and tenure tracks for SHES faculty is likely to raise novel issues regardless of the mix of scholarship, teaching, and service formally used as evaluation criteria. In the absence of senior SHES faculty, junior SHES faculty are likely to have to work much harder to convince their much more conventional colleagues of the merits of scholarship, teaching, and service that are unconstrained by disciplinary boundaries (see Pfirman et al., 2019, pp. 221–22). The institutional and cultural milieu of every college or university is unique, which means that the most viable strategies for meeting the challenge of supporting SHES faculty are likely to vary widely across the academy. Notwithstanding this likely variation, the most important thing that any college or university could do to support SHES faculty is to be explicit about its commitment to the SHES approach to sustainability education (see Pfirman et al., 2019, pp. 222–23). One way of demonstrating this commitment, at least in general terms, is by lodging sustainability-focused degree programs in their own department or higher-order administrative unit (see, e.g., Mulkey et al., 2019, pp. 243–44; Reiter & Smardon, 2019, pp. 231–32). Without an explicit commitment of that type, meeting the challenge of supporting SHES faculty is likely to be a much more formidable task.

Supporting SHES Program Design

Implementing the SHES approach to sustainability education in the design of degree programs, whether as their sole pedagogical theme or as a complement to one or more other pedagogical themes, presents at least one crucial design challenge. At its core, the SHES approach to sustainability education is a holistic one. For that reason, it is also supradisciplinary. Yet, disciplinarity remains the pedagogical touchstone for the design of degree programs worldwide, although sometimes mostly as a foil for highlighting the program's own efforts to reduce or to overcome the reductionism inherent in discipline-based thinking. Five basic program design models exist, some of which are more conducive to the implementation of the SHES approach than others (see Reiter et al., 2012, pp. 111–12; see also Barresi et al., 2015, p. 501 Table 1; Reiter et al., 2011, pp. 64–65; Reiter & Smardon, 2019, pp. 229–30). *Unidisciplinary* programs, such as programs in history or geology, view their subject matter from a single discipline's perspective. *Multidisciplinary* programs, such as environmental studies programs made up of unidisciplinary courses in the natural sciences, social sciences, and humanities, invoke many disciplinary perspectives applied separately. *Transdisciplinary* programs, such as programs in geophysics or historical archeology, recognize points of intersection among otherwise separate disciplines. *Pluridisciplinary* programs, such as programs in cultural psychology, recognize some overlap among disciplines but preserve the distinctions among them. *Interdisciplinary* programs, such as programs in ecology or integrated environmental science or studies, view their subject matter from a perspective synthesized from more than one discipline but applied as a coherent whole. It is hard to imagine how the SHES approach to sustainability education could be implemented in a unidisciplinary, multidisciplinary, or transdisciplinary program, even at the course level. Pluridisciplinary programs are likely to be more conducive to the implementation of the SHES approach at the course level but not at the program level. Accordingly, pluridisciplinary programs are

likely to be most valuable from a SHES perspective as potential stepping stones to a more conducive programmatic setting. Interdisciplinary programs are likely to offer the best opportunities for implementing the SHES approach to sustainability education at both the course and the program levels. Interdisciplinarity is not supradisciplinarity, however, which implies at least some uncertainty about whether even students in interdisciplinary degree programs that include some SHES courses could achieve supradisciplinary SHES learning outcomes at the program level.

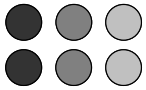
APPROACH	CONNOTATION	SYMBOL	DISCIPLINARY PERSPECTIVE	EXAMPLE	PEDAGOGICAL IMPLICATIONS FOR ACHIEVING THE GOAL OF THE FIELD
Unidisciplinary	**One, Single, Alone**		**Views sustainability from a single discipline's perspective**	**Geology**	**Unlikely to be effective**
Multidisciplinary	**Many, Several**		**Invokes many disciplinary perspectives applied separately**	**Chemistry + Biology + Geology + Philosophy + History + Political Science (as in some Environmental Studies programs)**	**Unlikely to be effective**
Transdisciplinary	**Across**		**Recognizes points of intersection among otherwise separate disciplines**	**Geophysics, Historical Archeology**	**Unlikely to be effective**
Pluridisciplinary	***Belonging to Many***		***Recognizes some overlap among disciplines, but preserves the distinctions among them***	***Cultural Psychology***	***Moderately likely to be effective***
Interdisciplinary	**Among**		**Views sustainability from a perspective synthesized from multiple disciplines, but applied as a coherent whole**	**Ecology, Integrated Environmental Science or Studies**	**Highly likely to be effective**
Supradisciplinary	**Above, Over, Beyond**		**Ignores disciplinary boundaries entirely**	**Sustainability**	**Most likely to be effective**

Figure 2. Approaches to disciplinarity and their implications for the likely effectiveness of degree programs in realizing the vision, fulfilling the mission, and achieving the strategic goal of the SHES approach to sustainable education. The unshaded rows of cells describe approaches that are not likely to be effective. The lightly shaded row describes a model that is more likely to be effective but primarily for transitional purposes. The darkly shaded rows describe the models that are the most likely to be effective. Adapted from: Barresi et al., 2015, p. 501 Tbl. 1; see also Reiter et al., 2012, p. 112 Fig. 2; Reiter et al., 2011, p. 65 Fig. 1; cf. Reiter & Smardon, 2019, p. 230 Fig. 15.1.

The uncertainty about whether even students in interdisciplinary degree programs that include some SHES courses could achieve supradisciplinary SHES learning outcomes at the program level raises the question of how degree programs with some SHES content could be structured to maximize the likelihood that students could achieve program learning outcomes of that type. The Roundtable evaluated the suitability of five existing or potential program structures in that regard and concluded that some are likely to be much more effective than others (see Reiter & Smardon, 2019, pp. 233–34). The first type of program is structured like a triangle, with a broad base and specialization at the apex. The second type is structured like an inverted triangle, with a narrow, disciplinary base and then more integrated coursework later in the program. The third type is structured like a diamond, in which students start with a grounding in a discipline, then broaden their focus, and then specialize again at the end of the program. The fourth type is structured like an hourglass, which starts out with a broad focus, then requires students to specialize but ultimately requires them to broaden their perspective again by synthesizing what they have learned along the way. The fifth type is structured like an expanding sphere, in which students approach the subject matter from a broad but simple perspective and then gradually add complexity to it while always maintaining its breadth (see Reiter et al., 2012, pp. 213–14; cf. Reiter & Smardon, 2019, p. 235). Programs structured like triangles or inverted triangles are not likely to enable students to achieve supradisciplinary SHES learning outcomes at the program level. Programs structured like diamonds or hourglasses are more likely to enable students to do so. Programs structured like an expanding sphere offer the greatest prospects for success in that regard. Those programs would be such a radical departure from the current norm, however, that they would be likely to raise daunting program design, course delivery, and graduate marketability issues, at least for now (see Reiter & Smardon, 2019, p. 234).

Go to Next page

Design	Connotation	Symbol
"Triangle"	Broad base, then Specialize	
"Inverted Triangle"	Disciplinary base, then Broaden	
"Diamond"	Disciplinary base, Broaden, then Specialize	
"Hourglass"	Broad base, Narrow, then Synthesize	
"Extensional"	Simple to Complex, but always Broad	

Figure 3. A summary of the basic program design models. The unshaded rows of cells describe models that are not conducive to the SHES approach. The lightly shaded row describes a model that is more conducive to that approach but primarily for transitional purposes. The darkly shaded rows describe the models that are the most conducive to the SHES approach. Source: Reiter & Smardon, 2019, p. 233 Figure 15.2; see also Reiter et al., 2011, p. 72 Fig. 5; Reiter et al., 2012, p. 114 Fig. 3; cf. Barresi et al., 2015, p. 503 Tbl. 3.

Broader Institutional Support and Recognition for the SHES Approach

Hovering above the issues of supporting SHES faculty and SHES program design is the challenge of how to ensure broader support for and recognition of colleges and universities that choose to do so. Ideally, that support should come from both inside and outside the institutions in question. Four internal institutional imperatives stand out in that regard (see Mulkey et al., 2019, p. 246). The first is the need for colleges and universities to recognize on an institution-wide basis that cultural insights drawn from the humanities and social sciences have a crucial role to play in transforming unsustainable societies into sustainable ones. Without the benefit of these insights, it is not possible for anyone to grasp in a holistic way how human societies have become so unsustainable worldwide. The second imperative is for the institution's leaders to embrace the vision of colleges and universities as institutions that must be dedicated wholeheartedly to the transformation of unsustainable societies into sustainable ones through teaching, learning, research, and outreach. Reducing campus operating costs in ways that happen to nibble around the edges of an institution's ecological footprint is not enough. The third imperative is for the governing bodies of colleges and universities—whether public or private—to interpret their fiduciary responsibilities holistically enough to embrace the full range of current and potential impacts of the institution on the sustainability of the society in which that institution is embedded. From managing its investment portfolio to ensuring that academic programs are ethically conceived, developed, and delivered, the governing body of every college and university must carry out its fiduciary duties with the sustainability of the society in mind. The fourth imperative is the rationalization of the allocation of scarce resources within colleges and universities in the light of this holistic fiduciary duty. Allocations made in the service of short-term returns on investments are not only inconsistent with this fiduciary duty but also increasingly ineffective in the face of the pace at which the educational and employment marketplaces are changing. Allocating resources in a way invariably calculated to promote the sustainability of the society in which the college or university is embedded is much more likely to redound to the benefit of all stakeholders both inside and outside the institution.

The need for external support for and recognition of colleges and universities that embrace the SHES approach to sustainability education is also a pressing one (see Mulkey et al., 2019, pp. 247–48). The Sustainability Tracking and Rating System (STARS) of the Association for the Advancement of Sustainability in Higher Education (AASHE), which awards points for sustainability in administration, the physical plant, and curriculum, offers whole institutions a means of recognition (Mulkey et al., 2019, p. 247). The networking opportunities available to AASHE members also provide a means of support. Kappa Alpha Omicron, the Interdisciplinary Environmental Association's honor society for interdisciplinary environmental science and studies students at colleges and universities around the world, offers those students both recognition and an external support network not available in discipline-based honor societies (Mulkey et al., 2019, p. 248). Opportunities for support and recognition of specific relevance to the SHES approach to sustainability education would be even better. One of the items on the Roundtable's current agenda is to work toward that goal.

Conclusion

There is no more higher calling for colleges and universities than to contribute in a holistic way to the transformation of the societies in which those institutions are embedded from unsustainable societies into sustainable ones. The SHES approach to sustainability education can be an invaluable tool in helping colleges and universities to make substantial progress toward fulfilling that calling. The aspirational goals of the SHES approach raise complex implementation issues with both pedagogical and administrative dimensions. Yet, the SHES approach is designed to be universally applicable, regardless of institutional or subject matter context, including as a complement to educational approaches that colleges and universities are using now. As such, the SHES approach is flexible enough to enable proponents to capitalize on the opportunities for implementation that exist now at any college or university of interest while highlighting what will need to be done to overcome any institutional constraints.

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