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Integrating sustainability learning outcomes into a university curriculum

A case study of institutional dynamics

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Abstract

Purpose – Higher education institutions increasingly have gained momentum in integrating sustainability into university curricula. The purpose of this paper is to elucidate the approval, implementation and management process of the new university-wide, general education requirement in sustainability at the University of Vermont (UVM). The intent is to provide a case study to inform other institutions seeking to create similar university-wide sustainability requirements.

Design/methodology/approach – The authors applied a process framework focused on institutional dynamics and values to analyze UVM's success in instituting a sustainability requirement across the curriculum. These two frameworks can provide a more general application of this case study to other institutional contexts.

Findings – The case study suggests that in the context of a diverse disciplinary and administrative environment at a university, the strategic unfolding, approval and implementation of UVM's university-wide, general education sustainability requirement can provide a general model for other universities seeking to embed sustainability across the curriculum.

Originality/value – It is uncommon for research universities with multiple professional schools to offer a university-wide requirement in sustainability. This case study analyzes the creation of a sustainability requirement at UVM by using a process framework to organize the complex, multi-stakeholder activities and events that eventually resulted in a successful curricular change. Thus, it is potentially instructive for institutions seeking to integrate a learning outcomes-based sustainability requirement into a university curriculum because it is generalizable to other institutions and pushes forward our understanding of institutional change.

Keywords General education, Sustainability education, Sustainability-across-the-curriculum, Learning outcomes, Liberal education

Paper type Case study

Introduction

Society in the twenty-first century faces many daunting challenges from myriad directions, including, but not limited to, peak oil, undiminished global population growth, intensifying income disparity, new political instabilities, terrorism, global scale weather catastrophes,



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growing global food insecurity, new technology impacts and evolving diseases. (Martine and Alves, 2015; Raskin *et al.*, 1996; Rockström *et al.*, 2009). Higher education, and public higher education in particular, has an important and vital role to play in helping society move through these challenging times and emerge on the other side of the century in a more hopeful and positive place (Cortese, 2003; Dmochowski *et al.*, 2016; Rowe, 2007; Shephard, 2008; Stephens *et al.*, 2008; Svanström *et al.*, 2008). Educating the next generation of leaders under the lens of sustainability paves the way for balancing economic growth, social development and ecological vitality (UNESCO Section of Education for Peace and Human Rights, Division for the Promotion of Quality Education, Education Sector, 2006; Wixom *et al.*, 1996). Certainly, training students to be good at what they do, whether it be engineering, food science, the arts or history, is a way that a university's role can be fulfilled, in part, but is there something more? Is there a component of public university education that is openly utilitarian in its aspiration?

The debate around general education and liberal education at universities (Nussbaum, 2002; Weissman, 2012) has grappled with this utilitarian perspective at both the individual level (useful to the students who are paying tuition) and the societal level (beneficial to the society that is financially supporting higher education). Liberal education model includes comprehensive education that encourages an appreciation of knowledge, an ability to think and solve problems and a desire to improve society, and general education advocates for practical education that prepares students to enter the work force upon graduation (State University, 2018). In the mid-1900s, the President's Commission on Higher Education (1948, p. 49) called for the development of a balance between professional training programs under a general education model and a liberal education curriculum that fosters "the transmission of a common cultural heritage toward common citizenship on the other", therefore promoting that higher education must serve both efforts. Yet, the continuing question is how to implement these complementary yet distinct models on an institutional level. Clearly, this has been answered in many different ways in different institutions. A similar question can be asked about a liberal education, in general, again with many different answers playing out across the wide spectrum of colleges and universities globally.

One might argue that in a rapidly changing world, continuing to probe the significance of general and liberal education is a necessary task for academics. This is certainly true for the University of Vermont (UVM), as its current vision statement indicates a "comprehensive commitment to liberal education, environment, health, and public service." Its current mission elaborates this vision to specify the learning outcomes for its students:

To create, evaluate, share, and apply knowledge and to prepare students to be accountable leaders who will bring to their work dedication to the global community, a grasp of complexity, effective problem-solving and communication skills, and an enduring commitment to learning and ethical conduct (Office of the President, 2008).

The details of this vision and mission are revealed in the emerging definitions of general education (i.e. an institution-wide core curriculum) as they move through faculty curricular processes. In May 2011, UVM's Faculty Senate endorsed the recommendation of the Joint Committee on General Education (Administration and Faculty Senate) to establish six learning outcome categories:

- (1) Communication and Information Literacy.
- (2) Quantitative Reasoning.
- (3) Cultures, Diversity and Global Perspectives.
- (4) Sciences, Systems and Sustainability.

-
- (5) Art, Aesthetics and Design.
 (6) Integration and Application of Knowledge.

Sustainability
 learning
 outcomes

The aforementioned programs were envisioned to fit within the general education model in promoting both critical thinking and the students' global awareness (State University, 2018). Currently, UVM has approved four slightly modified areas of general education: Foundational Writing and Information Literacy, Diversity, Sustainability and Quantitative Reasoning. While this developing curriculum is referred to as "general education," it incorporates aspects of the knowledge, skills and values embedded in many conceptions of liberal education. Gaff (2004) nicely summarizes various conceptions of general and liberal education and calls for faculty engagement in the rich conversation about how these concepts can be operationalized at individual institutions. Decades of advocacy by many, including the Association of American Colleges and Universities (AAC&U, 2007), to promote liberal studies as part of university-wide curriculum has influenced many institutions' approach to general education, including UVM. The AAC&U's LEAP "Essential Learning Outcomes" (Freeland, 2009) include knowledge, skills and values components that influenced the framework for UVM's sustainability general education requirement.

The Joint Committee on General Education recommended a learning outcomes approach to establishing general education at UVM. As discussed in several sections below, the decision to use a learning outcomes approach to general education was a key element of success in both gaining approval and engaging faculty across disciplines to support a sustainability requirement. The learning outcomes for the sustainability requirement at UVM follow the transformative sustainability learning framework (Hill and Wang, 2014; Sipos *et al.*, 2008). The structure of the learning outcomes-based requirement encourages evaluation of sustainability topics under a discipline-specific lens encapsulating knowledge and skills with an emphasis on affective learning under the personal values domain of sustainability (Table I).

Values	Framework
Patient and resilient	It took five years of dedicated, voluntary faculty service time to overcome barriers, develop and implement the sustainability requirement
Passionate and engaged	Faculty and staff committee members volunteered to work on this initiative through a personal commitment to sustainability
Strategic and process-aware	Developing personal relationships and allies among various stakeholder groups was intentional. Each step of the process was strategically considered
Communicative and transparent	The committee addressed faculty and student concerns and worked within existing administrative structures
Collaborative and open to critique	The committee developed events and structures to engage the community and responded to comments publicly
Flexible	The committee created a flexible learning outcomes-based model that allowed students to meet the requirement in multiple ways (i.e. course, curriculum or experiential pathways)
<i>Sustainable</i>	
1. Curricular requirement	1. The curricular requirement itself must be sustainable to perpetuate over time
2. Workload for faculty and staff	2. The requirement must meet the needs of the faculty and staff involved in the process to balance the workload
3. Workload for students	3. The requirement must be flexible so that students meet the requirement within existing curricular frameworks

Table I.
 The values
 framework used to
 navigate institutional
 dynamics

The presence of sustainability learning outcomes (SLO) in either general education or liberal education is not unique, but it is certainly not common (Natkin, 2018). Given the dominant cultural concerns in the state of Vermont and at UVM, it is perhaps not surprising that sustainability might be part of general education, and not just an imperative in certain academic units such as natural resources or environmental studies (Fien, 2002; Reid and Petocz, 2006). Global problems are complex and have differential impacts throughout society, so education has a responsibility to adapt curricula to reflect these changes (Brown and Erickson, 2014; Gruenewald, 2003; Junyent and Geli de Ciurana, 2008; Kurland *et al.*, 2010). More interesting is the development of sustainability as a topic of relevance to liberal studies. This is an important part of UVM's case study, as it is elaborated below.

The purpose of this paper is to share the rationale and experience of incorporating sustainability into a general/liberal education curriculum (hereafter referred to as "general education"). Because it was a complex, multi-year process involving many parties with perspectives on and attitudes toward sustainability as part of general education, we use a "process" framework to assist in conveying what we feel are important aspects of how change was achieved. Our model of institutional dynamics (Figure 1) was partially based on the Curriculum Greening of Higher Education model outlined by Junyent and Geli de Ciurana (2008). In addition, we highlight a "values" framework (Table I) that we conclude is a key aspect of persuading a diverse group of disciplinary scholars (both faculty and administrators) to agree on adopting a new curricular dimension for all its undergraduate students. We hope this case study and our explanatory frameworks will be helpful to other institutions that are considering introducing sustainability into a university-wide curriculum.

Background to the case

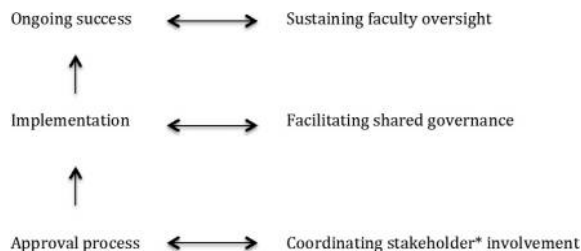
Sustainability in higher education

Sustainability is a rapidly emerging concept in higher education. The development of the Association for the Advancement of Sustainability in Higher Education (AASHE) is a good indicator of this trend. Started in 2001 as the Education for Sustainability Western Network, it evolved into AASHE in January 2006. In 11 years, this has grown to a 1,000-member organization with global representation. AASHE (2017) lists 445 institutions in ten countries that have an explicit interest in reporting curricular sustainability efforts through the Sustainability Tracking, Assessment and Rating SystemTM (STARSTM) process. These efforts take myriad forms reflecting the diverse missions of international higher education institutions to infuse sustainability into the curriculum.

Many of the courses with sustainability-related content evolved independently of any international initiative for sustainability in higher education, reflecting the individual

Figure 1.

A simplified process framework for interpreting institutional dynamics associated with implementing a sustainability general education requirement



interests and perspectives of instructors. Certainly, curricula such as environmental studies, environmental science and natural resources are rich in examples of sustainability and sustainability-related courses (Reid and Petocz, 2006). However, the interdisciplinary STARS™ course database reflects a growing attention to the profound issues facing twenty-first-century society. Sustainability as part of general education is a particular form of how this topic impacts higher education curricula.

The concept of sustainability as fundamental to the university curriculum has not been widely adopted across R1/2 doctoral research universities in the USA, with the exception of Portland State University (Natkin, 2018; [Carnegie Classification of Institutions of Higher Education, 2018](#)). A handful of small liberal arts colleges in the USA, including Babson College, St. Lawrence University, Central College, Green Mountain College, Oberlin College and Unity College, do have general education requirements in sustainability (Natkin, 2018). As such, we might take individual institution's efforts to do this as experimental, with something to be learned from each different attempt.

Sustainability at the University of Vermont

UVM is located in Burlington, VT, and is the state's land grant institution with approximately 13,000 students (approximately 10 per cent graduate students) and eight undergraduate academic units. About 70 per cent of the undergraduate enrollment is from out-of-state, but the majority of students come from New England in the northeastern USA. Vermont is a small New England state (9,600 m², sixth smallest) with a population of 625,000 (2010 census, second smallest), with dominant economies related to technology services, recreation and health services, agriculture (dairy, food crops, wine, cheese, etc.), education and government services. UVM is rooted in values long associated with the State of Vermont, including "fairness, social justice, environmental stewardship, openness, independence, lack of pretense, and the achievement of practical results" (Hudspeth, 2002).

The University has a typical shared governance model with an administrative structure (president, provost, deans, department chairs); an elected, representative Faculty Senate; a Staff Council; and a Student Government Association (SGA). The Faculty Senate has standing committees including a Curricular Affairs Committee that brings curricular proposals (including General Education) to the full Faculty Senate for vote. The Faculty Handbook places the responsibility for curriculum in the hands of the faculty. There is also a Faculty Union, which typically is not involved in curricula. UVM has a Center for Teaching and Learning and an Office of Sustainability, both of which report to the Provost's Office.

UVM has been in a leader in the teaching and research of environmental issues (Sullivan, 2018). Sustainability and sustainability-related courses have been present in UVM curricula from the advent of its natural resource and environmental studies programs. Established as a campus-wide environmental program by presidential mandate in 1972, these programs took a leading national role in taking an interdisciplinary approach to educating the next generation of environmental and natural resource practitioners (Kaza, 2012). As prominent programs with many majors, faculty and students, these programs advocated for sustainability at the institutional level (food, purchasing, recycling, land management, curriculum, etc.). This laid a foundation for sustainability as both an integral part of serving society and a component of liberal education. The institution's community values expressed in "Our Common Ground" states that UVM is "an educationally purposeful community seeking to prepare students to live in a diverse and changing world." In the context of the emerging challenges of the twenty-first century, this preparation includes envisioning and planning for a sustainable society. In addition, Our Common Ground speaks to "the

transforming power of education.” An analysis focusing on institutional dynamics and a values framework for UVM’s general education sustainability requirement can provide useful insights for other institutions considering a similar university-wide initiative. As the population and climate change clocks tick away, higher education’s role in preparing students for whatever they may encounter in the middle- to late-twenty-first century becomes more and more critical.

A framework to interpret institutional dynamics

University-wide curricular change is a daunting and complex process at most institutions. For a requirement involving 10,000+ students, a whole host of processes, procedures and policies apply, with impacts on students’ programs of studies, registration/auditing, tuition revenue flows, faculty workload, curricular administration, etc. To help organize this complexity as it applied to UVM’s experience in implementing a sustainability general education requirement, we offer a timeline of events (Table II) and a process framework to interpret institutional dynamics (Figure 1) and values adopted by the committees working to implement curricular change (Table I). Our timeline and framework elucidate how the sustainability requirement moved from approval to success with the continuous involvement of committees working with various stakeholders (i.e. all parties with an interest in the sustainability curriculum, regardless of authority) through shared governance.

At UVM, it is the combined responsibility of faculty and administration to shape the student experience. Although faculty own curriculum, it is the administration that provides the capacity to unfold the curriculum. For example, the faculty do not have the authority to manage the systems of registration, transfer, etc., and the Registrar’s Office serves this important role at the institution. Because the governance is shared, to create large-scale curricular innovation, faculty must be able to overcome potential conflicts between faculty and administration, especially when the traditional general education course-based model does not serve the interdisciplinary, learning outcomes-based sustainability requirement. In this case from UVM, a particular set of values (Table I), maintained throughout the various institutional processes required for curricular change, may have been instrumental to the eventual success of the endeavor. Each step had its own kind of complexity, and UVM, with its long history since its foundation in 1791, is clearly a unique university with distinctive academic cultures and institutional traditions. Our two-part framework (i.e. institutional dynamics and values framework) seeks to generalize, to the extent possible, our particular experience so that it might provide insights to others contemplating similar curricular innovation.

Curricular approval processes are probably very similar across many universities, but the political component of the process is often unique. A “bottom-up” approach from the student body and invested faculty initiated the first steps in implementing a sustainability requirement at UVM (Table II). Implementation of a requirement that must have the capacity to serve 10,000+ students over a four-year period is a complicated curricular exercise. Without designating a “College of General Education” or similar administrative structure to do the work needed to create the curriculum, the ideal of “shared governance” is tested to its functional limits. The specific campus leaders, offices and governing bodies (Department Chairs, Registrar’s Office, Faculty Senate, etc.) involved are different in every university, but the needed functions to shape the student experience are generally common across institutions. Identifying and coordinating these entities become a key part of implementation. In particular, given tight university budgets and the reality of overworked staff and faculty, facilitating shared governance

Sustainability
learning
outcomes

Year	Action
2009	First cohort of Sustainability Faculty Fellows (SFF) are recruited for the one-year professional development program
2010	SGA resolution calls for a university-wide sustainability requirement
2012-2014	SLO <i>ad hoc</i> committee forms with co-chair model meets biweekly for three semesters
2013-2014	<i>Open feedback solicited on draft SLOs</i> Dissemination of SLO committee working wiki site Open for a for students and faculty Blog soliciting faculty feedback on SLOs SLO committee presents regularly to Faculty Senate SLO committee presents to SGA
Spring 2014	<i>First Faculty Senate votes on sustainability requirement solicited</i> SGA and Faculty Senate approve SLO Official formation of the SCRC, a subcommittee of the Faculty Senate; dissolution of the SLO ad-hoc committee
2014-2015	<i>Second Faculty Senate votes on sustainability requirement solicited</i> SCRC develops structure and policies of proposed SU requirement SCRC finalizes UVM's sustainability definition SCRC develops sustainability proposal process for instructors SCRC presents regularly to Faculty Senate on proposed sustainability requirement SCRC addresses faculty concerns, including capacity and assessment, and reports back to Senate SCRC reviews existing STARS TM sustainability-focused courses as one-year provisional sustainability (SU)-designated courses to build course capacity
Spring 2015	Faculty Senate approves a new sustainability requirement for all students entering in Fall 2015
2015-2016	<i>Implementation of sustainability general education requirement</i> SCRC solicits and reviews proposals for SU approval SCRC works with various stakeholders (including SFF) to build academic capacity in the curricular and experiential pathways SCRC garners administrative support for general education as a whole Sustainability General Education Assessment Committee is formed SCRC regularly presents findings to Faculty Senate (e.g. model SU course capacity was exceeded for 2015-2016)
2016-2017	<i>Maintenance of sustainability requirement</i> SCRC policies are developed SCRC proposal solicitation and review continues General Education Coordinating ad-hoc committee forms General Education assessment continues university-wide

Table II.
A timeline of key strategies and events in the approval, implementation and maintenance process for the UVM's university-wide general education sustainability requirement

through the development of personal relationships was important at each step of the process. Making demands on staff with specific job responsibilities would have impeded implementation of the requirement.

Curricular design, including the structure of the requirement, mechanisms of assessment and the timing and positioning of faculty oversight, is key to ensuring ongoing success. Creating expectations about the process that are sustainable in our institutional context (workload and teaching/research expectations) is a critical component at this stage of program development. In the section below, we use a linked process framework (Figure 1 and Table I) and offer a timeline (Table I) to explore our specific steps and experiences with the hope that insights can be generalized to other institutions in useful ways.

Case study of institutional dynamics at the University of Vermont

Approval process – developing stakeholder relationships

UVM's sustainability initiative began with a grassroots effort of the undergraduate student population. The SGA passed a resolution in 2010 supporting "the creation of a university-wide sustainability curricular requirement for all incoming undergraduate students at the University of Vermont" (Table II). UVM's Faculty Senate vice-president, who was a strong proponent of sustainability at UVM, called a meeting to gather faculty and administrators interested in working on the SGA's resolution to develop the general education sustainability requirement. This meeting resulted in the formation of the SLO committee as an *ad hoc* committee of the Faculty Senate. The SLO committee was co-chaired by the paper's authors and consisted of faculty from all eight UVM undergraduate degree-granting colleges and schools and stakeholders throughout UVM, including representatives of the SGA, the Graduate Student Senate, the Sustainability Faculty Fellows program, the Office of Sustainability, the Associate Provost of Teaching and Learning and the Faculty Senate president. The committee met biweekly for three consecutive semesters. The charge of the SLO committee was to develop SLO, design the options by which students could meet the requirement, engage the UVM community at large in thinking about sustainability and considering this as part of general education and gain passage of the sustainability requirement through the Faculty Senate. Coordinating stakeholder involvement at key points in any process is likely to assist in achieving a favorable outcome. If passionate and engaged stakeholders can work together toward a common goal, the process of seeking approval can often be successful in the end. As described below and in Figure 2 and Table II, the process involved consistent communication with many stakeholders and was a patient and persistent one.

The faculty chose to pursue sustainability as a general education requirement rather than exploring other pathways because UVM had a strong, existing sustainability curriculum that was anticipated to grow under the auspices of the Sustainability Faculty Fellows Program under the Center for Teaching and Learning (Kaza *et al.*, 2015). The development and approval of the sustainability general education requirement at UVM was dependent upon the leadership efforts of Sustainability Faculty Fellows program. In addition, the Faculty Senate had committed to develop university-wide curricula under the general education model. However, an interesting context is that UVM's Faculty Senate had not formally voted to adopt a General Education curriculum at the university at the beginning developmental stages of the sustainability initiative. Rather, faculty working groups developed General Education initiatives outlined previously in the Introduction as the outcome of individual grassroots student and faculty interests. UVM's diversity

Figure 2.

The SLO committee collaborated with various stakeholders throughout the institution to disseminate information about the requirement, respond to concerns and gain stakeholder support



requirement, for example, was an outgrowth of multiple student protests in the 1980s that had pockets of faculty and staff support in the early 1990s. In addition, UVM's foundational writing and information literacy requirement resulted from a decision by a first-year faculty general education committee to focus on a single requirement rather than create the overall general education learning outcomes-based curriculum.

The SLO committee designed the requirement to be flexible (Table I). UVM's sustainability general education requirement was designed to be flexibly fulfilled by students completing an approved sustainability course, enrolling in an approved curriculum (i.e. major) or completing an approved experiential pathway that addresses the learning outcomes.

The requirement's flexibility deviated from the standard higher education method to achieve general education requirements by completing a specific course from a list of options.

The goal of the general education sustainability requirement at UVM was to embed sustainability throughout the university curriculum and encourage the faculty among the disciplines to teach sustainability under a disciplinary-specific framework. To reach this goal, the committee used the backwards design model and began its work developing the SLO. The SLO committee was intentionally transparent and inclusive about the process of developing the four categories of SLO (knowledge, skills, values and the personal domain, Table III). It is important to note that the SLO have an ingrained curricular philosophy for advancing the liberal studies imperative (AAC&U, 2007; Freeland, 2009), as the aims of the SLO are to prepare students, under a disciplinary approach, to address current, pressing local and global challenges. In the spirit of backwards design, the SLO committee first identified our desired results and then shifted focus to design and implementation details and forms of assessment.

The SLO committee's charge from the undergraduate population was to infuse sustainability into all university curricula, and therefore, the committee solicited discipline-specific feedback on the SLO (Table III). It hosted two open fora to vet the learning outcomes and gain feedback from the student, staff and faculty. In addition, the SLO committee developed a wiki website for educating the UVM community about:

- SLO;
- work on this topic at colleges and universities nationally; and
- the ongoing work of the committee.

The SLO committee also created a blog to allow the university community to provide online comments on the draft SLO.

SLO	Learning outcomes category
Students can have an informed conversation about the multiple dimensions and complexity of sustainability	Knowledge
Students can evaluate sustainability using an evidence-based disciplinary approach and integrate economic, ecological and social perspectives	Skills
Students think critically about sustainability across a diversity of cultural values and across multiple scales of relevance from local to global	Values
Students, as members of society, can recognize and assess how sustainability impacts their lives and how their actions impact sustainability	Personal domain

Table III.
UVM's SLO

The SLO committee regularly presented progress to the Faculty Senate during the development of the sustainability general education requirement and educated faculty about how sustainability can be infused into various disciplines (Table IV). The committee highlighted internal examples from courses taught by sustainability faculty fellows, as well as examples from AASHE's Disciplinary Associations Network for Sustainability (DANS). The Sustainability Faculty Fellows program, which is hosted by the Center for the Teaching and Learning, is, in large part, responsible for building the sustainability curriculum prior to the requirement's adoption (Table II; Kaza *et al.*, 2015; Natkin and Kolbe, 2016). Currently, UVM boasts all eight undergraduate degree-granting units offering at least one sustainability-related course under the STARSTM ranking system (Table V). Nonetheless, faculty, particularly in professional programs, expressed discontent about students having to meet yet another university requirement. Other faculty expressed concern that sustainability does not relate to their respective discipline. This feedback steered the SLO committee during the approval process to:

- emphasize on the inherent flexibility in the requirement; and
- continue to educate faculty on how sustainability pertains to different disciplines under the DANS framework via presentations to the Faculty Senate (Table II).

Table IV.
A Sampling of multidisciplinary sustainability courses from UVM's largest undergraduate-degree granting unit, the College of Arts and Sciences

Department	Course #	Course title
Anthropology	ANTH 021	Cultural Anthropology
Studio Art	ARTS 095	Art, Design and Environment
Biological Sciences	BCOR 102	Ecology and Evolution
Chemistry	CHEM 095	Environmental Risk
Classics	CLAS 095	Sustainability: A Cultural History
Economics	EC 133	Economics of Environmental Policy
English	ENGS 051	Topics in Composition
Geography	GEOG 145	Geography of Water
Geology	GEOG 006	How the Earth Works
German	GERM 52	Intermediate German
Philosophy	PHIL 010	Ethics of Eating
Political Science	POLS 196	Cyber Policy and Conflict
Religion	REL 195	Religious Perspectives on Sustainability
Sociology	SOC 001	Introduction to Sociology
Spanish	SPAN 111	Race, Identity & Migrant Labor
Western Literature	WLIT 017	German Literature in Translation

Table V.
Distribution of sustainability courses among all eight undergraduate degree-granting units at the UVM

Unit	No. of courses	% of courses
BSAD	1	1
CALS	21	21
CAS	35	34
CEMS	8	8
CESS	2	2
CNHS	1	1
HCOL	7	7
RSENR	27	26

A majority Senate vote was necessary to implement the new sustainability requirement. The SLO committee was intentional in the deliberate, slow unfolding of the new requirement, took time to educate faculty and paid close attention to address concerns to on-board faculty throughout the process. The SLO committee chairs presented to the SGA and ultimately gained approval in the form of a 2014 SGA resolution, supporting the four SLO and encouraging a curricular approach (Table II).

Throughout the Senate process, the committee continually made the case that UVM had a strong, existing sustainability curriculum in large part because of the Sustainability Faculty Fellows program (Kaza *et al.*, 2015). UVM has a gold rating from the AASHE STARS™ program in 2014 and 2017 based on our performance in four main areas: education and research; operations, planning; administration and engagement; and innovation (Thompson, 2014). Our score placed us among the top 12 per cent of all rated institutions (Sullivan, 2018). The committee utilized the examples pulled from the diverse array of existing sustainability-focused courses in our STARS™ portfolio. As of the 2016-2017 academic year, 134 sustainability faculty fellows from over 30 academic units have completed the program. Prior to the requirement, approximately 75 per cent of matriculated undergraduate students had already enrolled in a sustainability course over a four-year time period. Because the committee proposed a learning outcomes-based general education requirement that could be completed at any point throughout the four-year degree program, these data were convincing that UVM had the capacity to inaugurate a new sustainability requirement.

As intrinsic to the deliberate, collaborative and patient unfolding of the requirement, the SLO committee prepared a two-phase implementation plan for the Faculty Senate to adopt a university-wide general education requirement in sustainability for all UVM undergraduate students. The SLO committee first asked the Faculty Senate to vote on the following:

- Adopt the four SLO.
- Approve 52 UVM STARS™ sustainability-focused courses on a one-year provisional basis to meet capacity in the first year of the requirement.
- Form a new proposed formal senate subcommittee Sustainability Curriculum Review Committee (SCRC) as a formal subcommittee of the Faculty Senate (Table II).

Prior to bringing the motions (outlined in the Appendix) to the Senate, the SLO committee outlined the SCRC's purpose, membership framework and meeting schedule. The committee also provided guidelines for university-wide implementation in Fall 2015, including strategies for meeting capacity, proposal submission and review protocols, cycles of periodic review and transfer policies. Finally, the committee addressed assessment of the sustainability general education requirement, and the administration supported a pilot assessment project in collaboration with the Office of Sustainability. The motions passed the Senate (Table II), and the *ad hoc* SLO committee formally morphed into the SCRC in 2015.

Many members of the SLO *ad hoc* committee remained on the SCRC, including the authors who co-chaired both committees. The consistency and historical knowledge of the original work was an asset to the committee's streamlined process for the following 2014-2015 academic year. As with SLO *ad hoc* committee, the SCRC consisted of faculty from all UVM undergraduate degree-granting colleges and schools, ex officio members of the Sustainability Faculty Fellows program and the Office of Sustainability, the Associate Provost of Teaching and Learning and the Faculty Senate president. As did the SLO committee, the SCRC continued to work with stakeholders across campus.

Throughout the next academic year, the SCRC regularly presented to the Faculty Senate in an effort to gain approval for the new university-wide sustainability requirement from skeptical Senators. The faculty remained unconvinced that UVM had the course capacity to initiate the sustainability requirement and, on a more fundamental level, lacked consensus about whether to adopt sustainability as a university-wide general education requirement. The committee tackled both issues separately, and they will be discussed as such.

Reaching consensus. To reach a majority vote to inaugurate the sustainability requirement at UVM, it was important to demonstrate how sustainability is related to various disciplines. The committee approached our Faculty Senate presentations specifically with an educational mission to educate faculty on:

- the complexity and ambiguity of the term *sustainability*; and
- how sustainability pertains to different disciplines.

The Faculty Senate requested a formal definition of sustainability, and so, the SCRC developed the following meaning of sustainability at UVM:

[At the University of Vermont,] sustainability is the pursuit of ecological, social and economic vitality with the understanding that the needs of the present must be met without compromising the ability of future generations to meet their own needs.

The notion of sustainability builds on the definition of the term “sustainable development” laid out by the Brundtland Commission ([World Commission on Environment and Development, 1987](#)). In addition, it is closely aligned with other higher education institutions, such as Penn State University’s definition that “sustainability is the simultaneous pursuit of human health and happiness, environmental quality, and economic well being for current and future generations” ([Penn State’s Sustainability Institute, 2018](#)), and the University of Kentucky:

[...] recognizes that in its mission to improve the lives of Kentuckians, its greatest challenge in our time is to engage the University community to create policies and programs that will simultaneously advance economic vitality, ecological integrity and social equity, now and into the future ([University of Kentucky’s Office of Sustainability, 2018](#)).

In addition, to provide examples of sustainability across disciplines, the committee used both general AASHE DANS list and example courses from former UVM sustainability faculty fellows. This effort was successful in bringing to light how sustainability could be taught outside of the environmental studies and sciences, and committee members garnered examples from diverse disciplines such as romance languages, arts and humanities, physical sciences and economics ([Table IV](#)).

Tackling the capacity question. It was important to demonstrate that UVM had existing capacity to successfully implement a new sustainability requirement. The committee developed a predictive capacity model in collaboration with UVM’s Office of Institutional Research (OIR) and the Registrar’s Office ([Table VI](#)). The involvement of these two administrative offices played a key role in persuading faculty that UVM has existing capacity for a new sustainability requirement. The simple capacity model assumptions were built upon data from OIR. The committee built a capacity model assuming that the majority

of students enrolled in sustainability (SU) courses would be first- and second-year students, and the remaining students would meet the SU requirement by taking a SU course in their junior or senior year (Table VI). Each additional year would require additional seats to accommodate an estimated 2,400 newly matriculated students.

Recall that the Senate had approved the AASHE STARS™ “sustainability-focused” courses under interim status in 2014 (Table II). The SCRC used these courses to seed our capacity model to demonstrate that UVM had existing course capacity to serve the first-year student entering under a new university-wide sustainability requirement (Table VI). In addition, the committee bolstered the seat capacity by soliciting faculty who *intended to submit* sustainability course proposals and adding their courses to the capacity model. This allowed us to predict meeting the seat capacity necessary for the incoming approximately 2,400 first-year students.

The capacity model outputs indicated that 840 seats in SU-approved courses would be needed to meet the requirement in academic year 2015-2016 (Table VI). The Registrar’s office used historical registration data to tally 2,437 total SU seats for academic year 2015-2016 (Fall semester = 1,376 seats + Spring semester = 1,061 seats), thus greatly exceeding model capacity in Year 1 of the requirement.

To summarize, the SCRC spent the 2014-2015 academic year developing a convincing argument that sustainability is an interdisciplinary concept that allows for each respective discipline to introduce and reinforce ecological, economic and social sustainability topics in a unique and discipline-specific manner. This follows the deep learning model (Warburton, 2003) that fosters creative interdisciplinary approaches to sustainability through a disciplinary lens. In addition, the committee presented a plausible capacity model that demonstrated an excess of seats in current sustainability courses. With the support of the Faculty Senate Executive Council and allies throughout campus, the SCRC introduced a motion to UVM’s Faculty Senate to approve a university-wide, general education sustainability requirement for new students matriculating in Fall 2015 (outlined in the Appendix). The resolution passed the Senate by majority vote, although it was far from unanimous (i.e. 61 per cent approve, 32 per cent oppose and 7 per cent abstain). As is inherent to a double-edged sword, the committee was delighted that the sustainability requirement was passed but recognized that its work had just begun.

Implementation – working through shared governance

We are currently writing UVM’s account after implementing the requirement for four successful semesters. Although we can celebrate success from the hard work of curricular

% student body enrolled in SU ^a course	Newly enrolled students by year	Historic retention rate	No. of transfer students	Total no of seats needed
35	1	0.87	400	840
35	2	0.77	50	1,131
20	3	0.75	–	372
10	4	–	–	121

Table VI.
Simple capacity model and data for course seat capacity to support the UVM’s sustainability general education requirement

Notes: Students can meet the requirement by enrolling in a SU^a course during any semester of study, and the “total number of seats needed” column reflects the nature of the four-year SU requirement (2015-2019). The model estimates annual enrollment of approximately 2,400 first-year students plus 450 transfer students. Retention and transfer estimates are based on UVM historical data. ^aSU = sustainability course designated by UVM’s SCRC

and administrative management of over 100 courses offered to over 5,000 students, there is definitely room for improvement and maturation in the following academic, administrative and assessment areas:

- building capacity for meeting the requirement via the curriculum-based and experiential pathways;
- garnering administrative financial and staff support for general education as a whole; and
- assessing student teaching and learning in general education requirements.

In the following section, we discuss each of the aforementioned areas in turn, paying particular attention to the collaboration across the diverse stakeholders involved in implementation.

Academics. The UVM sustainability requirement is meeting the capacity for students to complete the sustainability requirement within four years; but to maintain and build course capacity, the Sustainability Faculty Fellows program (staff and faculty collaborators) must continue to receive annual funding and successfully solicit wide faculty participation. As of Fall 2017, UVM currently has only three approved sustainability curricula (i.e. students majoring in environmental studies, civil engineering or environmental engineering). Recall that the undergraduate SGA consistently encouraged the curriculum-based pathway as a means to meet the sustainability requirement, so the committee has more work to do to garner faculty interest in building sustainability curricula rather than relying on a course-based model.

Because the sustainability requirement is learning outcomes-based rather than credit-based, students can flexibly fulfill the requirement through the experiential pathway via either a student-driven experiential pathway (i.e. individual students fill out a template explaining what they did to learn the SLO and then demonstrate their learning) or a faculty-driven experiential pathway (i.e. a faculty member applies for their research project, internship, club, program, etc. to earn sustainability designation). The SCRC has met with various stakeholders to encourage creative thinking in the design of various experiential pathways. The committee makes the experiential option available to students in the form of a template posing the following two questions for each of the four SLO:

Please describe the experiential activity that taught content related to this learning outcome Please describe what you learned about this learning outcome.

The SCRC plans to review the completed experiential proposals on an individual student and faculty basis; however, the SCRC has yet to receive formal proposals for the experiential pathways.

In part, the hesitation to adopt a comprehensive and centralized general education curriculum at UVM is because our existing course tracking system is ill-prepared to handle the shift from auditing individual courses to managing an interdisciplinary framework intrinsic to a learning outcomes-based curriculum. We recommend working with stakeholders, such as the Registrar, and paying attention to the details. In addition, it is difficult to handle courses that transfer into the institution as sustainability-equivalent courses. As of now, UVM has an interim transfer policy that *any course that is transferred in as the equivalent of a UVM sustainability-approved course will thereby allow the transfer students to be approved in fulfilling the General Education Sustainability requirement.* This essentially implies that at our institution, any transfer student with the equivalent of Introduction to Sociology (SOC 001) will automatically have met the sustainability requirement when it is clear that other institution's introductory sociology courses very

unlikely meet the UVM SLO (Table III). We are continuing to work with various stakeholders to introduce efficiencies and streamline the process.

Administrative. There are a number of issues burdening all current general education committees at UVM because of a lack of a centralized, administrative Office of General Education present at other institutions with general education requirements (e.g. Penn State, Harvard University and Southern Methodist University). Additionally, the disparate general education initiatives at UVM currently lack coherence, as is typical of general education reform (Boning, 2007). Therefore, the SCRC recommended that the Faculty Senate work to garner a single committee of faculty to prospectively investigate general education and university curricula. The Faculty Senate president called various meetings of general education committees to develop an *ad hoc* General Education Coordinating Committee to bring clarity, consistency and efficiency to the approval, delivery and management of General Education at UVM. Basic structures and functions have been proposed, but the *ad hoc* General Education Coordinating Committee is in the beginning stages, as the general education requirements proceed without a centralized management body of faculty, administrators and advisory student representatives.

Assessment. UVM is currently building a more robust culture of assessment according to the New England Association of Schools and Colleges (NEASC) standards for accreditation (NEASC, 2016). These assessment efforts have expanded beyond degree programs to include assessment of teaching and learning in general education. The development of assessment practices currently involves the Provost's Office, a faculty/staff committee, the Center for Teaching and Learning and academic unit administrators. The former SLO committee had assessment in mind as we developed the SLO (Table III). The committee wrote the learning outcomes under the knowledge, skills and values framework and worked with faculty to evaluate the SLO based on a mix of cognitive, skill-based and affective outcomes (Shephard, 2008). This forward thinking and eye toward assessment has been helpful to the initial efforts of the Sustainability General Education Assessment Committee.

The Sustainability General Education Assessment Committee believes, in line with Walvoord (2010, p. 4), that the "goal of assessment is information-based decision making". Assessment allows us to discern how well the sustainability requirement is achieving stated goals and to identify opportunities for improvement. During the Fall 2016 semester, 37 faculty who were teaching sustainability designated courses were invited to participate in the assessment process. In total, 11 faculty agreed to participate, representing a range of disciplines and class formats. Since Fall 2016, the Sustainability General Education Assessment Committee, a committee separate from the SCRC, has been using a variety of tools to collect data to determine the degree to which students are meeting the intent of the outcomes, including the following:

- faculty appraisal of student learning survey;
- faculty interviews and focus groups; and
- student focus groups.

The aforementioned tools will allow the Sustainability General Education Assessment Committee to determine the degree to which students are meeting the intended learning outcomes, provide direct feedback to faculty and identify in collaboration with participating faculty opportunities for professional development to advance practice and to identify the effectiveness of the tools. These data will also lead to pertinent research questions on the most impactful activities that reinforce the SLO. In line with the ethos presented by Walvoord (2010), the Sustainability General Education Assessment Committee is committed

to identifying support for faculty to ensure that the assessment cycle offers both meaningful feedback to faculty and opportunities for professional development through the Center for Teaching and Learning. One idea that is gaining resonance is a rubric workshop, which would support faculty in developing rubrics that advance our collaborative understanding about what it means to be proficient with each of the four SLO.

In sum, the assessment process to-date is working collaboratively and supporting faculty as it unfolds, including professional development of faculty with the goal of developing meaningful teaching and learning experiences for students. Again, the Sustainability General Education Assessment Committee relies on an understanding of institutional dynamics (Figure 1) and an underlying values framework (Table I) to instill a culture of assessment of general education at UVM.

Ensuring ongoing success – sustaining faculty involvement

The success of the sustainability requirement requires both institutionalization of key elements of the management and delivery of learning outcomes and continued advocacy for the requirement among faculty, students and key staff positions. Institutional dynamics change from the initiation phase to the maintenance phase. For example, sustaining faculty enthusiasm for including learning outcomes in their syllabi can benefit from careful management of class sizes, providing adequate teaching support (e.g. teaching assistants to help evaluate learning outcomes), ongoing professional development to assist with effective teaching practices (e.g. rubric development) and appropriate recognition from chairs and deans for the work of the faculty to promote the institutional goals of general education.

As indicated in the section above, an efficient and effective assessment infrastructure is an important part of ongoing success. In the case of UVM, this is in its early stages of development. Collaboration between administrators pushing for assessment and faculty responsible for carrying out assessment is key. In addition, student cooperation in the various types of assessment practices is important. Management of the multidisciplinary portfolio of sustainability courses requires both time (appropriate position descriptions for staff and dedicated workload for faculty) and sensitivity to faculty culture. An example of this is the periodic review of courses.

When the university-wide sustainability requirement was adopted at UVM in Fall 2015 (Table II), the committee designed a five-year periodic review of courses to maintain the rigor of sustainability content given the anticipated change in instructors and course content over time. We have yet to formally undergo a periodic review because of the recent adoption of the requirement. That said, the committee has begun to visualize a process that incorporates a series of prompts to encourage faculty to reflect on the teaching of the SLO. A reflection component of the periodic review will benefit the requirement in two major ways:

- (1) Faculty reflecting on learning outcomes serves as a source of indirect data for assessment of university-wide learning outcomes.
- (2) Faculty are asked to summarize data from course-level SLO assessment and include any actions taken to implement change.

While voluntary removal of the sustainability designation may happen without significant trauma, a decision to require its removal will need to be handled with discretion by all involved.

As the sustainability general education requirement evolves at UVM, close attention to the interplay among institutional stakeholders (Figure 1) and adherence to values (Table I) that support the complex and often ponderous process of academic change may assist with

ongoing success. We offer these two frameworks to provide useful insights into how success can be managed when navigating a complicated, university-wide curricular change.

Discussion

From our experience developing, implementing and assessing UVM's university-wide general education sustainability requirement, we offer some broad-spectrum recommendations that we highlight as key to our success to other higher education institutions seeking to embed sustainability across a university curriculum. Sensitivity to institutional processes and keeping a set of values foremost in deciding when and how to proceed were essential in the UVM case.

The initiative began with a resolution for a university-wide sustainability requirement from the SGA, and consistent student support for the requirement was seminal throughout the entire approval and implementation process. The long-standing Sustainability Faculty Fellows program had trained an extensive population of faculty to teach sustainability. Therefore, UVM had a strong, multi-disciplinary suite of sustainability courses prior to the formal approval of the requirement. The SLO committee first developed the SLO (Table III) and then tackled the capacity question (Table VI) by using the backwards design pedagogical method. The SLO committee carefully and patiently crafted UVM's SLO to align with the university's mission and vision while inviting the students to participate in the SLO development process. We vetted the SLO and garnered feedback from the entire institution through a variety of information dissemination methods prior to seeking Faculty Senate approval. Then, the committee paid careful attention to student and faculty feedback and made modifications as necessary. The committee kept the entire process open and transparent and continually updated the UVM governing bodies (Faculty Senate, SGA) on progress. The committee members listened carefully to faculty concerns and followed up by working closely with UVM's administration, faculty and students to appropriately address concerns.

The SLO committee recognized that building authentic relationships throughout the university community through transparent communication would be paramount to a requirement that affected all UVM undergraduates and the faculty who taught them. Therefore, the co-chairs developed a committee structure that included faculty from all undergraduate-degree granting units on campus, and the committee interacted with a multitude of stakeholders across campus (Figure 2).

The SLO committee met regularly for two years to strategically develop the sustainability requirement prior to formal approval. The committee met biweekly and adopted a co-chair model that allowed the workload to be evenly divided between two dedicated faculty members. Together, the co-chairs developed a working model of the values framework (Table I), understood institutional structure and politics (Figure 1) and brought expertise in sustainability teaching and research in higher education. The perseverance and dedication of the sustainability committees (i.e. SLO *ad hoc* committee and SCRC) was paramount to our success, as an inordinate amount of time and effort was periodically needed to keep the proposed new requirement on track for approval.

The SLO committee used existing "one-year provisional" courses based on STARS™ sustainability-focused approved courses to build first-year capacity. In addition, we collaborated with the existing Sustainability Faculty Fellows program to continue to build capacity. The committee developed a course proposal process for faculty, as well as defining assessment metrics. Therefore, we were in good standing to meet capacity and successfully implemented the sustainability requirement in Fall 2015 (Table VI).

The implementation phase was streamlined because of the high level of committee effort during the approval process. However, much inefficiency was evidenced once the sustainability requirement was implemented, and the committee realized the need for an overarching general education institutional structure. Therefore, we collaborated with the administration, Faculty Senate and other general education committees and recommended a joint general education coordinating *ad hoc* committee to streamline the process of executing an institution-wide curriculum.

Currently, the SCRC revisits and revises existing policies affecting students and continues to update the Faculty Senate in a series of presentations and reports. The SCRC collaborates with the Sustainability General Education Assessment Committee to determine whether UVM students are meeting the SLO. We are one year into developing assessment protocols and will report assessment findings once the data are collected, analyzed and publicly available in NEASC self-study in 2019.

Conclusions

This paper highlights the values and institutional steps toward implementation of a university-wide learning outcomes-based sustainability requirement at UVM. The process involved a suite of “nuts and bolts,” including developing SLO, planning for implementation, vetting the process along the way, collecting and presenting data, developing capacity models, designing faculty proposal guidelines and integrating assessment into the sustainability requirement (Table II). All that said, we advocate that our readers develop a *values framework* (Table I) and understand institutional dynamics (Figure 1) when instituting new sustainability requirements at other institutions, as the values intrinsic to our process was a seminal component to our success.

Essential to our values framework (Table I) was *patience* and *intentional action*. The committee anticipated solutions through education, outreach, research and partnership to overcoming expected barriers (Velazquez *et al.*, 2005) and utilized the process and values framework to guide our actions. Yet, it took five years and dedicated faculty service time to bring forth the sustainability requirement resolved by the SGA (Table II). Along the way, the committee was *process aware* and cognizant of the institutional roadblocks, thus garnering allies and on-boarding stakeholders along the way. We gained *credibility* by presenting quantitative metrics to the Faculty Senate pre- and post-implementation. Committee members were *communicative* and *transparent* with all stakeholders, including faculty and students. Our process was *collaborative* and *open to critique*, which the committee responded to in a timely and transparent manner. As intrinsic to the requirement, the committee was also *flexible* in addressing faculty and student concerns and working within the administrative structures in place. Finally, our objective was to create a new requirement that was *sustainable* for the individuals executing the requirement to ensure the perpetuation of the requirement at our institution.

It is our hope that sharing UVM’s case study of integrating sustainability into a university curriculum may provide useful lessons for institutions that wish to implement an institution-wide sustainability requirement. We offer various tips to streamline the process, as well as a generalized framework that others can use for structural and implementation purposes, so that higher education can play a key role in training students to meet the myriad challenges of the twenty-first century.

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Appendix

The motions presented to the UVM Faculty Senate by the SLO committee in 2014 and SCRC in 2015.

Motion to adopt sustainability learning outcomes

Be it resolved that the Senate approves the following sustainability learning outcomes:

- Students can have an informed conversation about the multiple dimensions and complexity of sustainability.
- Students can evaluate sustainability by using an evidence-based disciplinary approach and integrate economic, ecological and social perspectives.
- Students think critically about sustainability across a diversity of cultural values and across multiple scales of relevance from local to global.
- Students, as members of society, can recognize and assess how sustainability impacts their lives and how their actions impact sustainability.

Motion for implementation

Be it further resolved, that the *ad hoc* SLO Committee works with the Office of Sustainability to grant interim AY 2014-15 approval of a subset of the 52 UVM STARS™ sustainability-focused courses that closely meet the four SLO and also solicit curricula for approval from any interested departments.

They work together to create a SCRC that would begin its work in Fall 2014 to review course, curricula and co-curricular proposals for meeting the SLO. The SCRC will report their efforts to the Faculty Senate Curricular Affairs Committee.

Motion to require sustainability learning outcomes under general education

Be it resolved, that beginning with entering Fall 2015 undergraduates, the SLO be made a general education requirement.

Be it also resolved, that the following language be used in the course catalog:

Sustainability Learning Outcome (SLO) Requirement: Beginning with the entering first-year class in fall 2015, all undergraduates must meet the Sustainability General Education Requirement for the University of Vermont. To meet this requirement, students must complete a course, curriculum, or co-curriculum prior to graduation that has been approved by the Faculty Senate's Sustainability Curriculum Review Committee.

About the authors

Dr Laura Hill holds a BSc degree in Environmental Biology and a PhD in Biology. Laura is currently a Senior Lecturer and Research Associate in Plant Biology at the University of Vermont (UVM). Laura is recognized for her excellence in undergraduate teaching and advising at UVM. She teaches courses in general botany, plant biology and sustainability, introductory biology and genetics. Her research experience has been focused on rare plant ecology and evolution, plant-animal interactions, pollination biology, plant mating systems, population viability analyses, conservation management, and sustainable agriculture. Laura is actively involved in assessment of student teaching and learning at UVM. She is also acknowledged for her transformative leadership that led to the approval of the learning-outcomes-based general education sustainability requirement at UVM, one of the few doctorate-granting research universities in the US with a Sustainability General Education requirement for all undergraduate students. Laura is the former co-chair and current member of the Sustainability Curriculum Review Committee. Laura was the proud recipient of the Environmental Protection Agency's Region 1 Environmental Merit Award which honors on-the-ground environmental work. Laura M. Hill is the corresponding author and can be contacted at: lhill@uvm.edu

Dr Deane Wang is an Associate Professor Emeritus at the University of Vermont (UVM) in the Rubenstein School of the Environment and Natural Resources. Deane holds a BA in General Studies, a MS in Plant Ecology, and a PhD in Forest Ecology. Dr Wang taught courses relating to ecology and education including conservation, greening, systems, and sustainability. Working with graduate students (ecological planners and field naturalists), Deane emphasized service-learning and experiential learning. Deane also supported an undergraduate summer service corps called LANDS. Dr Wang's research has been on biogeochemistry and nutrient cycling at the ecosystem and landscape levels, and most recently on sustainability and education. Deane was a research associate at Yale and the Institute for Ecosystem Studies, an assistant professor at the University of Washington, and an associate and acting dean at the Rubenstein School of Environment and Natural Resources at UVM.

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