

Beyond interdisciplinary: how sustainability creates opportunities for pan-university efforts

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Abstract In many universities, sustainability is gaining currency in the classroom, in research, and in practice. This paper will examine how George Washington University has crafted sustainability education as a pan-university program. We briefly discuss the origins GW's sustainability efforts, then explain how the vision of a pan-university approach was developed. GW's Academic Program in Sustainability does not reside in any one school—instead it sits under the Office of the Provost. As such, Sustainability belongs to all schools. We next discuss the development of a pan-university sustainability minor, open to all students, and featuring courses and faculty from all schools at the university. As universities undertake efforts to integrate sustainability into the curriculum, an important element is team-teaching. Because sustainability is inherently trans-disciplinary, courses that are team-taught generate multiple perspectives on the same issues, leading to dynamic and engaging discussions with faculty and students. We examine the success of the Introduction to Sustainability course that uses five faculty from five different schools at GW to provide students the exposure to how different disciplines problem solve around sustainability, and how a team approach lends itself well to the learning outcomes of the course. There is also tremendous value in student experiential learning around sustainability. GW requires Sustainability minors to complete an internship or service project around sustainability, and we discuss how this is structured. We also

highlight how the process of creating a pan-university program in sustainability provided an opportunity for faculty collaboration, creativity, and “thinking outside the box” approaches. Finally, by positioning sustainability as pan-university, we have met with challenges. We address the challenges and obstacles to creating a genuinely pan-university effort that seeks to escape the traditional “silos” of schools and departments and to move beyond interdisciplinarity as well.

Keywords Sustainability curriculum · Pan-university objectives · Innovations in sustainability education

George Washington University at a glance

Undergraduates: 10,433
Graduate students: 14,607;

10 Schools:

Columbian College of Arts and Sciences
Elliot School of International Affairs
School of Engineering and Applied Sciences
School of Law
School of Business
Graduate School of Education and Human Development
Milken Institute and School of Public Health and Health Services
School of Nursing
School of Medicine
College of Professional Studies

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Sustainability education has helped motivate university leaders to think beyond traditional boundaries and see the value in interdisciplinary approaches involving collaboration between experts from two or more academic

disciplines.¹ Much has been written about interdisciplinary education and how the field of sustainability has contributed to moving higher education in this direction (Barlow and Stone 2011; Burns 2011; Cloud 2014; Hyun 2011; Medrick 2013). But what if interdisciplinary education is an insufficiently grand vision for how sustainability can transform higher education? The evolution of thinking and experimentation at GW has led to the conclusion that interdisciplinarity, as valuable as it is, may not be the ultimate goal. Sustainability education has the potential to be structured as pan-university; in this article, the GW experience with, and ambitions for, pan-university education are shared. While not without challenges, the benefits of pan-university education and its potential for innovation has, according to GW leaders, been worth the pursuit (Rusinko 2010).

Developing the vision and structure for GW sustainability education

When the 16th GW President, Steven Knapp, was inaugurated in 2007, one of his first actions was to convene a Task Force on Sustainability. Knapp realized that no institution of GW's size and standing could avoid recognizing the environmental implications of its actions, nor could it avoid its obligation to contribute to solving the problems of sustainability. He challenged the Task Force to consider strategies to move GW beyond basic environmental compliance efforts and become a sustainability leader (George Washington University Presidential Task Force on Sustainability 2008). At the time, GW had little to brag about: sustainability had not played a significant or consistent role in previous institutional decisions. This was regrettable, but it also presented an opportunity to reimagine how GW might embrace and embed sustainability in research, teaching, practice, and outreach. It also meant that GW was primed to see sustainability as an entry point for advancing awareness, learning, and discourse about matters of social and global importance (GW Task Force, 2008; 11).

As with many other universities, the GW discussion and implementation of sustainability started with operating practices because this is an area where budget saving can be realized. For example, reducing energy consumption and implementing recycling are common operational targets. As a first step, the Task Force recommended creating an Office of Sustainability to provide a strategic home for sustainability

¹ The terms interdisciplinary, multidisciplinary, and transdisciplinary connotes research and teaching that cross many disciplinary boundaries. Although each of these terms is distinct, they are often confused with each other because they all relate to moving beyond disciplinary boundaries. Interdisciplinarity combines two or more academic disciplines in research projects or teaching and attempts to create something new by crossing boundaries. We use the term interdisciplinary in this paper because it is the most widely used when discussing sustainability (see for example, Buszard and Kolb 2011; Parker 2010).

practice on campus and in the community. Knapp established such an office, giving it the leadership, funding, and clout to influence university decisions. As a result, GW quickly made visible progress in its campus greening efforts.

Yet the Task Force recognized that GW's greatest opportunity for impact was within the classroom and it recommended that the University expand the variety and quality of sustainability-related courses, programs, and degree offerings and create new opportunities for interdisciplinary study. Further impetus came from a GW Trustee Committee on Sustainability, formed in 2011, which charged the faculty and staff to develop a big and ambitious vision for sustainability. The Trustee-led challenge provided momentum and, more importantly, clear and unambiguous support for crafting a bold and comprehensive academic vision. Litledyke and colleagues have noted such support is vital for success (Litledyke et al. 2013).

Finding the best approach for GW sustainability education

The university provost appointed a faculty member from each of the ten GW schools to form the Faculty Committee on Sustainability (hereafter Committee). The Committee was tasked with figuring out how best to imbed sustainability in the curriculum and make GW a leader in the field. Before pursuing any particular strategy, the Committee sought to understand how the concept of sustainability and its attendant principles were implemented in academic programs across the USA. In 2005, international leaders declared education as a motor for change and the United Nations General Assembly implemented the Decade of Education for Sustainable Development (UNESCO 2011). This call to action, and a growing recognition of the importance of sustainability, led to a boom in educational offerings. There were only a handful of sustainability majors, minors, or certificates offered then; by 2009, more than 100 had emerged (Schmit 2009). By 2013, a US census of environmental and sustainability academic programs found sustainability programs were expanding dramatically from 13 in 2008 to 141 (Vincent et al. 2013). Many of the new degree programs were in the category of Environmental Studies or Environmental Science, but there were also a growing number of sustainability-specific degrees and minors, certificates, along with sustainability specializations within disciplines and professional degrees (Vincent 2012). Thus, there were many examples from which the Committee could draw best practices. But it also meant that there was no single direction to follow. In addition to studying the mega-data on sustainability education, the Committee closely examined 14 schools reputed as leaders in the field, including Stanford, Duke, Michigan, Columbia, and Arizona State.² Not surprisingly, there

² The 14 schools include Arizona State, UC Berkeley, Columbia, Cornell, Duke, Harvard, MIT, Michigan, University Minnesota, Princeton, Stanford, University of Wisconsin, and Yale.

was great diversity in how sustainability education was structured across these schools; however, four distinct approaches emerged. The Committee considered each before choosing a path forward.

The first approach to sustainability education was to develop unique, stand-alone sustainability degree(s). In the process of considering this approach, the Committee was surprised to find that in 2011, few degree programs in sustainability existed (although it should be noted that each year since, several sustainability degree programs have been launched around the USA). Of the 14 schools analyzed, Arizona State University and Columbia offered undergraduate degrees in sustainability; there were more sustainability degrees at the graduate level, with graduate degrees and certificate programs offered at ASU, UC Berkeley, Columbia, Michigan, Princeton, Stanford, and Yale. However, this approach was tabled. The Committee's focus was undergraduate sustainability education, and several GW leaders voiced concern that undergraduates need a disciplinary-based degree. They urged that sustainability be considered only as a second major or a minor. Furthermore, there was some confusion about how a sustainability degree would differ from, and potentially compete with, a thriving undergraduate environmental studies program. Although the sustainability degree approach was discarded for undergraduates, to this day, these conversations continue at GW, with degree expansion targeted at the graduate level.

The second approach was to create an institute or center dedicated to sustainability education. Across the sample of 14 universities, nearly every institution had multiple centers and institutes related to sustainability, with many of them long-established environmental centers. Some of the centers and institutes offer degrees. For example, Columbia University offers both undergraduate and graduate programs in the Earth Institute and also has an active post-doctoral program. The Earth Institute boasts sustainability-specific degrees (such as the BA in Sustainable Development and a PhD in Sustainable Development) and also promotes other existing degrees elsewhere at the university, such as the PhD in Earth and Environmental Engineering and the MA in Climate and Society (based in the school of International and Public Affairs) and the MA in Conservation Biology (based in the school of Arts and Sciences) (see Columbia University Earth Institute 2015). A 2013 study of institutes and centers engaged in environmental science found one third of them are degree granting (Vincent 2013). While GW intended to establish a sustainability institute, at the time of the Committee deliberations, it had not yet been launched, and furthermore, adopting this approach would be complicated by its novelty since no GW institute had yet been empowered to grant degrees.

The third approach of establishing a stand-alone school of sustainability was briefly considered. In 2006, Arizona State University established the School of Sustainability as part of the Julie Ann Wrigley Global Institute of Sustainability, the hub of ASU's sustainability initiatives, which would

eventually grow to offer a minor, bachelor, master, and PhD degree in Sustainability (Arizona State University School Sustainability 2015). The Committee understood that this approach was the most daunting from a resource perspective, requiring significant new philanthropy. While the separate school strategy did not seem realistic in the short term, the idea of a separate school prompted the Committee to discuss whether and how such a structure would ensure that sustainability touched all GW students in some way, seeding the concept of pan-university sustainability education at GW.

In the end, GW chose the fourth and most common approach to sustainability education. This was to identify existing degree programs related to sustainability and organize them into a sort of matrix. The appeal of this approach was that by figuring out how degree programs contribute to sustainability education, coordination across campus would be facilitated, as well as the identification of course and degree gaps. The matrix approach also helped communicate the breadth and depth of university offerings by organizing what may have otherwise seemed like scattered degrees into a coherent whole and raise the university's profile in the field. The Committee noted that several universities used such an approach. Stanford University, for example, has several long-established programs such as the Energy Modeling Forum, the Center for Conservation Biology, the Emmett Interdisciplinary Program in Environment and Resources within the School of Earth Sciences, and more recently the Precourt Institute for Energy and the TomKat Center for Sustainable Energy (Stanford University 2015). Learning from this, the Committee identified existing GW degree offerings related to sustainability, and has since used this matrix to organize and connect faculty, understand potential synergies between current degree offerings, and identify opportunities for degree expansion (Table 1).

After several months of analysis and benchmarking research, the Committee made the following observations:

- There were many models of how to structure sustainability.
- Given the relatively small number of sustainability degrees being offered, there was opportunity to develop competitive sustainability degree programs.
- Faculty in many disciplines across all schools represented on the Committee had important contributions to make to any future degree programs, and many were enthusiastic to do so.
- Challenges existed in terms of how to best integrate existing centers, institutes, and programs with long-term visions; to position GW to be a leader, our vision must unify efforts.
- Given GW's location in Washington DC, there was an opportunity to focus sustainability on policy and governance (consistent with GW's existing strength in public policy).

The Committee's overarching and most important conclusion was that sustainability presented GW an opportunity to rethink traditional university structures. It not only presented the

Table 1 GW Sustainability related degrees and programs

Degrees & Programs at GW

Columbian College of Arts and Sciences

B.A. in Environmental Studies
M.A. in Environmental and Resource Policy
Ph.D. in Systematics and Evolution

Elliott School of International Affairs

M.A. in International Development
(Sustainable Development Focus)

School of Business

Certificate Program in Responsible Management
M.B.A. in Environmental Policy and Management
M.B.A. with emphasis in Sustainability and Corporate Responsibility
Ph.D. in Business Administration with a specialty in:
Strategic Management and Public Policy (with courses in environmental management and policy)
Tourism and Hospitality Management (with courses in Sustainable Tourism Destination Management)

School of Law

J.D. in Environmental Law
L.L.M. in Environmental Law

College of Professional Studies

Certificate in Sustainable Urban Planning
Certificate in Sustainable Landscapes

School of Public Health and Health Policy

M.P.H. in Environmental and Occupational Health
M.P.H. in Environmental Health Science and Policy
Dr. P.H. in Environmental and Occupational Health

School of Engineering and Applied Science

Offers M.S. and B.S. with specialties in:
Environmental Engineering
Geotechnical Engineering
Infrastructure Engineering
Solid Mechanics and Materials Engineering
Structural Engineering
Transportation Engineering
Water Resources Engineering
M.S. in Environmental and Engineering Management
M.S. in Civil and Environmental Engineering
Doctor of Science in Environmental and Engineering Management
Ph.D. in Civil and Environmental Engineering

opportunity to advance interdisciplinary education but GW sustainability efforts had the potential to unite disparate parts of the university. As a result, the Committee boldly envisioned an academic initiative that would not reside in any one department or school. It recommended, and the provost approved, the unusual arrangement of situating a new undergraduate Minor in Sustainability directly under the Office of the Provost. The Committee's objective was to make sustainability belong to all schools by deliberately *not* placing it in any one school. According to the 2012 report "Trends in Interdisciplinary Environmental and Sustainability Education," most sustainability academic programs reside in departments or specific schools, centers, or institutes, with 37 % administratively spanning schools or units (Vincent 2012). The GW plan to house sustainability at a higher administrative level, while not unique, was consistent with the more innovative solutions to administrative challenges.

In 2012, GW listed sustainability as one of nine core values of the university.³ Sustainability is also highlighted in GW's 10-year

strategic plan, *Vision 2021*. The plan focuses on "innovation through cross-disciplinary collaboration." The strategic plan recognized interdisciplinary research and teaching as an important trend in higher education and that the university needed to do more to foster collaboration and transcend existing boundaries of disciplines, departments, and schools. The strategic plan highlighted the newly launched GW Minor in Sustainability as a model for interdisciplinary programs. As a result, from the time of its inception, the Sustainability Minor has been closely watched, as it represents the university's first effort to build upon, and test, its vision for collaboration in teaching and research (George Washington University 2013).

The GW pan-university sustainability minor

Once the vision for high-level placement of the Sustainability Minor was embraced, it was time to create the curriculum. The Committee committed to the development of a pan-university Sustainability Minor, open to all students, and featuring courses and faculty from all schools at the University. The proposed Sustainability Minor received strong support from the Provost for three reasons. First, a minor would show

³ GW's nine core values include learning, building community, embracing diversity, respect, service, teamwork, and sustainability. We think it notable that while many of these core values are found at most universities, sustainability is not.

students that the University was responding to their interests around sustainability. Second, a minor could be undertaken with existing faculty resources. Finally, the pan-university structure provided opportunity for everyone at the University to engage at some level, consistent with the core value status of sustainability at GW.

Rather than create a minor based on several required courses and a limited number of electives (as some minors are at GW), the Committee suggested something novel: include *all* GW undergraduate courses that focus on or are related to sustainability, from across the schools and departments. The result is a genuinely pan-university minor that today encompasses approximately 127 undergraduate courses in the five schools that offer undergraduate courses. The intention was to be inclusive and to involve as many faculty as possible. This also means that the GW Sustainability Minor is inherently flexible and can be shaped according to the student’s interest in sustainability. At the heart of this strategy is an aspiration that any and all students can design the sustainability minor to complement and build upon their majors. The faculty relied on the significant literature to help inform the learning objectives (O’Byrne et al. 2014; Wiek et al. 2011). Table 2 outlines the learning objectives for the Sustainability Minor.

The Committee undertook a careful inventory of existing GW courses, and contacted faculty teaching these courses to get their approval to designate the course as a “Green Leaf” course, which signals its relevance to sustainability. Criteria were based on an amalgam of guidance from the AASHE and how the Committee embraced the “3 Es” approach to the concept of sustainability (see Table 3). It was stressed that the designation of any Green Leaf course is only at the approval of the faculty member teaching the course; at the early stage of developing the Green Leaf course list, it did not make sense to battle faculty by imposing such a designation without

Table 2 Learning objectives of the sustainability minor. The GW undergraduate Minor in Sustainability introduces students to the concepts, principles, and issues that inform the sustainability paradigm. The curriculum integrates classroom learning and community-based learning and research in a program that prepares students to apply the sustainability perspective to their future endeavors. All graduating students completing the requirements for the Minor in Sustainability will be able to:

- Apply the concepts of sustainability to issues of human welfare and social equity, the environment, and the economy
- Adapt and apply knowledge, theories, and methods learned to analyze sustainability issues and/or practices
- Connect and extend basic sustainability concept(s) to a critical problem facing society, using student’s involvement in the issue as the basis for analyzing the challenges and developing and solutions to the problem

Source: GW Faculty Committee on Sustainability 2011. “Proposal for Undergraduate Minor in Sustainability”

Table 3 Criteria for designation of a green leaf course at GW. To obtain a “green leaf” designation, a course should address issues around social, economic, and/or environmental sustainability and should include at least three of the following criteria:

- Content related to sustainable development: creating healthy and thriving resource systems for all
- Content related to environmental issues
- Content related to social issues that can be applied to sustainable development such as human welfare, social equity issues, or social/organizational/behavioral change
- Content related to economic issues that can be applied to sustainable development
- Discourse focused on the interconnection of world resources and the human condition from a long-term perspective
- Content related to policy and communications issues that can be applied to sustainable development

approval from the faculty who knew the course content best. Rather, the goal was to work with faculty who wanted to participate in the Sustainability Minor and to have them realize the value of increased student diversity in the classroom. The Committee did not want to be seen as “imposing” a designation without consent. In some cases, there was some back and forth conversations with faculty who initially were uncertain about the value of designating their class a Green Leaf course. For example, some faculty whose courses focused on issues around poverty, human rights, social justice, and human health were initially reluctant to see their courses as sustainability-related. However, the Committee felt because GW had a world-class Law School and School of Public Health, including courses that focused on human well-being and social equity would highlight the strengths of GW faculty in these areas. Often a personal conversation over a cup of coffee was a sufficient catalyst for the faculty member to understand that their course was an important part of the sustainability curriculum. It also allowed word to spread about sustainability as a concept and teaching tool. As more faculty have learned about the Sustainability Minor, many have responded by developing or revising courses to meet the Green Leaf designation.

The Committee structured the minor around three thematic “tracks” and required students to take at least one course in each track. This was intended to develop basic literacy in three areas. The Environmental and Earth Systems track focuses on science and engineering, and includes courses on climate, energy, water, and ecology. The Society and Sustainability track consists of social science and humanities courses that focus on human well-being and society and includes courses in public health, food, social equity, urban studies, international development, and economics. The Policy, Organization and Leadership track features courses such as methods, communication, policy, law, business, and organizational science. Given GW’s location and reputation in public policy, this track allowed GW to emphasize this expertise to students.

To reinforce the interdisciplinary and pan-university character of GW's sustainability efforts, a feature of the minor is that 6 of the 18 credits required for the minor must be taken *outside* of the student's home school. We began the minor with approximately 90 undergraduate Green Leaf courses; today, there are 127. Some of these courses are introductory level and appropriate for freshmen and sophomores; some are upper-division courses with pre-requisites. Some courses are large—with more than 100 students; others are less than 20 students. However, we have found it difficult to track enrollment in all Green Leaf courses because this is data provided only to the home departments, so a good accounting of enrollment history and by majors has proven challenging to get.

Team teaching

Davison has noted that as universities undertake efforts to integrate sustainability into the curriculum, an important element is team-teaching (Davison 2012). Because sustainability is inherently trans-disciplinary, courses that are team-taught generate multiple perspectives on the same issues, leading to dynamic and engaging discussions with faculty and students. One of the recommendations of the Committee was that an "Introduction to Sustainability" course be offered. The Committee also recommended that this be a team-taught course that would feature more than just one or two faculty from different disciplines. After more brainstorming, it was decided that the "Introduction to Sustainability" course would feature five faculty from five different schools at GW to expose students to how different disciplines problem solve around sustainability, and how a team approach lends itself well to the learning outcomes of the course. Inherent in this approach are multiple perspectives that help articulate how sustainability is understood and practiced by different disciplines. Interdisciplinary teaching is, of course, not new, and there are many studies that identify multiple positive outcomes of interdisciplinary team teaching (Anderson and Speck 1998; Arhar 1997; Murata 2002). One feature of the current team that teaches the "Introduction to Sustainability" course is that two of the faculty hail from schools that do not offer any undergraduate courses, thus exposing students to faculty they would not otherwise encounter.

The five faculty who developed the Introduction to Sustainability course were encouraged to think creatively about how best to convey the interdisciplinary character of sustainability. The course was developed over a spring and summer, in part because the planning process for a team-taught course is considerable. One faculty is the lead instructor, who takes charge of finalizing exams, projects, and meets weekly with the graduate teaching assistants; in addition, the lead instructor resolves grade disputes and has more availability in office hours. The structure of the course involves traditional lectures (the five faculty lecture on areas of their

expertise), several team-taught lectures, and several faculty "panel discussions." Four times during the semester, after lectures provide foundational knowledge around certain subjects, the five faculty have a panel discussion to highlight important trends and solutions from their disciplines. For example, there are several individual faculty lectures around climate science and energy; at the end of this module, the five faculty discuss climate change policy and technology solutions through the lens of law, public health, engineering, design, and geography. Similarly, after several lectures on basic ecology and water science, the faculty discuss how to improve water quality in the Chesapeake Bay. The panel discussions allow the teaching team to serve as models of professional disagreement and models of mutual respect (Anderson and Speck 1998). Because the panel discussions are run as a broad question/answer session, this format challenges students not to be passive receptacles of knowledge, but to participate. When developing the course, the faculty felt that this organization effectively blended individualized teaching responsibilities with shared teaching and discussion, and it also allowed the faculty to jointly teach and be present for many class meetings.

The team-taught introductory course has become a defining feature of the Sustainability Minor, and the overall sustainability education effort at GW. Today, faculty are in the process of developing several other team-taught courses around food, urban sustainability, and climate based on the introductory course. The GW faculty engaged in sustainability efforts view team-taught sustainability courses as opportunities to foster faculty learning communities, while also creating vibrant classroom experiences for students. Such communities have become the template for interdisciplinary approaches to higher education and have been widely discussed in the literature (for example, see Cos and Richlin 2011; Barlett and Chase 2004).

Experiential learning

Based on the literature on sustainability education, the Committee saw tremendous value in student experiential learning (see for example, Brundiers et al. 2010). GW is a school where students have demonstrated passion and commitment around public service. In the fall of 2009, for example, First Lady Michelle Obama challenged GW students to perform 100,000 hours of service; she promised to speak at Commencement if students achieved this goal. GW students surpassed that goal easily, and Mrs. Obama gave the 2010 Commencement address. Given student commitment to community and public service, the Committee suggested that the Sustainability Minor incorporate experiential learning. This is consistent with numerous pedagogical studies on sustainability education and the importance of participatory learning, experiential learning, and service-learning (Ellis and Weekes 2008; Jucker 2002; Kolb 1984; Ramey 2013; Sipos et al. 2008). Most studies agree that real-life problem-solving,

service-learning, personal reflection, and meaningful social interaction are among the important skills students can learn (Armstrong 2011; Bacon 2012).

As a result of a literature review and consideration of student interest in service, the Sustainability Minor requires students to complete a three-credit internship or service project around sustainability. It is framed as a challenge for students “to take sustainability from the classroom into the community,” and it is named the Sustainability Culminating Experience. The Sustainability Culminating Experience integrates service-learning by asking students to meet regularly throughout the semester they are doing their internship or service, and to complete several reflection essays that challenge them to make thoughtful and more deliberate connections between sustainability theories and practice. The Director for the Sustainability Minor organizes these seminars and provides feedback on the reflection essays. The concept of experiential learning as an important part of an academic experience has also become a defining element of the Sustainability Minor.

The creation of the Sustainability Minor required little money: faculty who helped create the minor in the Sustainability Committee volunteer as part of their service to the university. The operating budget is also lean. The Sustainability Minor Director is a full-time faculty member and receives a course release and a small stipend to direct the minor and to supervise the experiential learning. The costs associated with the introductory course, which include stipends for the five person faculty team and the salary and tuition benefits for two graduate teaching assistants form the bulk of the Sustainability Minor expenses to date.

Moving beyond silos: successes and challenges

The creation of the Sustainability Minor is a first step in meeting the Trustees charge to think big and be ambitious. Plans are underway to create other sustainability degrees at the undergraduate and graduate levels. For example, GW is about to launch a Master of Science degree in Green Chemistry. Various other degrees, along with executive education, continuing education, and certificate programs, are anticipated.

One of the unexpected benefits of creating a pan-university program in sustainability is that it also created a community of faculty with common research and teaching interests. One member of the Committee told us that sustainability planning meetings allowed him to get outside of his department and to gain new perspectives that have expanded both teaching and research collaboration. In a large university such as GW, faculty may find it difficult to meet other faculty experts in their areas of research, particularly outside their home departments or schools. An outcome of the creation of the minor has been the creation of faculty research working groups around issues such as water, climate, and urban sustainability. These

working groups include faculty from many different schools. Conceptualizing sustainability as a pan-university effort led to a detailed inventory of faculty research and teaching interests around sustainability; this inventory is publically accessible and published on the GW sustainability website (see <https://sustainability.gwu.edu/academic-programs>).

While there has been great success in positioning sustainability outside of traditional educational structures, there have been significant challenges. Several obstacles must be overcome to create a genuinely pan-university effort that fully escapes the traditional “silos” of schools and departments.

Team teaching

The success of the team-taught “Introduction to Sustainability” class has created positive outcomes among the faculty involved, and has moved beyond the silos of teaching within one or two disciplines. However, a challenge that has emerged is how to reward faculty who participate in large team-taught courses. If there is more than one professor for a course, how are multiple faculty contributions measured and rewarded? In the case of “Introduction to Sustainability,” participation is calculated by attributing 20 % of the workload to each of the five faculty and each receive a small stipend for their contribution. As described previously, the design of the introductory course requires faculty to contribute more than 20 % time, and furthermore, the notion of reducing the value of the collaboration down to specific hours in front of the class fails to recognize the collaborative nature upon which the course is built and executed.

No department at GW “counts” faculty participation in this introductory course as an entire course toward the faculty teaching load; in fact, the course is not counted as contributing toward any percentage of the courses faculty are expected to teach. Therefore, faculty engaged in team teaching must take it on as an extra responsibility in addition to their required teaching duties. Additionally, departments and schools do not necessarily view the faculty teaching in the introductory course as “contributing” to the teaching needs of their specific department or school (Benton-Short 2014a). And yet, the amount of time it takes to participate in a team-taught class is not necessarily significantly less than to teach a class individually. For the department and the school, teaching expectations remain entrenched in a system that values specific contributions *within* silos, rather than celebrating interdisciplinary teaching.

Governance

Another challenge has been that in placing sustainability outside traditional administrative structures, it has bypassed existing governance, including a review of curriculum that takes place inside schools. Vincent and colleagues have

described the inequity faced by most interdisciplinary sustainability degree programs, particularly in regard to their unequal standing relative to traditional disciplines (Vincent et al. 2015). The Sustainability Minor resides in the Provost Office, in contrast to other degree programs that reside in schools. A traditional organization chart starts with the department and its chair reporting up to the Dean on matters relating to curriculum development, new course offerings, budget and faculty hires, and student issues. Because Sustainability did not follow this traditional organization chart, some school administrators expressed concern that students do not have the full access to institutional protocol to protest grades (Benton-Short 2013, personal communication). For example, in the traditional model, a student can protest a grade with their professor, then the Department Chair, then the Dean. Similarly, a faculty member concerned about plagiarism or violations in academic integrity has a chain of command to follow. But sustainability has no Dean, so it does not follow the traditional forms of governance and institutional protocol. Given these concerns, the Committee has been temporarily tasked to act as mediators and ombudsman. Second, calls for proposals, reminders about university deadlines, and notices about awards and scholarships are frequently disseminated directly to the schools, which in turn notify chairs, who in turn notify faculty. Often the Sustainability Program is forgotten in this chain of information distribution.

Another challenge related to governance is fundraising. At GW, a significant number of Development and Alumni Relations staff are tasked to raise money for specific schools. Staff have expressed concern about whether raising money for a pan-university program will be valued by their school. Similarly, Deans feel the pressure to raise money for their own schools and have less incentive to encourage their school alumni to donate to a larger vision.

Belonging

The intention in placing the academic program in Sustainability under the Office of the Provost was to instill a spirit that Sustainability was a pan-university effort that belonged to all schools. However, some schools do not feel collaborative ownership of sustainability. One example occurred in 2012 and again in 2013. The College of Arts and Sciences hosts an annual “Majors Fair.” Each department staffs a table where faculty advisors are available to discuss the major, minor and provide additional information about careers, classes, and research opportunity. The Sustainability Minor was excluded, and the Academic Director for Sustainability was told that this was because the sustainability minor is not a Columbian College degree program (Benton-Short 2013, personal communication). It seems that some schools see Sustainability as *not ours*, rather than to see it as integrated within and belonging to all schools.

Another challenge is “homelessness.” It is difficult to secure dedicated space for Sustainability when schools see their own space as a scarce resource and are hesitant to give space to an administrative unit not of the school. Currently, the Sustainability Collaborative and the Academic Program in Sustainability are housed in temporary offices, but this means students and faculty have no homebase to visit and to interact with their colleagues.

Tenure

One of the biggest challenges that confront any interdisciplinary program is how to value faculty teaching and research in the tenure process. According to Pfirman et al. (2005), interdisciplinary faculty are confronted with conventional departmental hiring, review, and tenure procedures that are not suited to interdisciplinary work. Interdisciplinary faculty can have several homes and in some cases may have to do extra duty to attend multiple sets of departmental meetings. Interdisciplinary scholars may publish their work in journals not typically valued or recognized by the home department. In addition, it is not often that Centers and Institutes are allowed to contribute their own external or internal reviews of a faculty member. Many universities have guidelines that address interdisciplinary teaching; fewer address interdisciplinary research and publications. While this is not a new insight, it remains a challenge at GW. A new hire, a junior faculty member who considers himself part of the Sustainability Collaborative, admitted, “My formal home is in the Economics Department and there is the expectation that I will publish only in the top Economics journals. I’m not sure my colleagues would place much value on a publication in a sustainability journal, or in a journal outside of Economics.” (Benton-Short 2014b, personal communication). And yet it is often the junior scholar who has the most interest and energy around interdisciplinary collaboration. GW has work to do to shift both the cultural and procedure around interdisciplinary tenure and promotion if we are going to succeed at creating more degree programs and hiring more faculty to work in jointly held positions in sustainability.

Advancing pan-university sustainability goals

Most sustainability efforts are inherently interdisciplinary. For example, GW’s Environmental Studies BA degree is interdisciplinary in that students take classes in Geography, Geology, Biology, Chemistry, Sociology, and History. But the Environmental Studies degree relies on courses that are primarily housed in one school, the Columbian School of Arts and Sciences. So while the major is interdisciplinary, it is not pan-university. The GW vision seeks to elevate sustainability beyond interdisciplinary to pan-university, to more fully integrate faculty and courses from all schools.

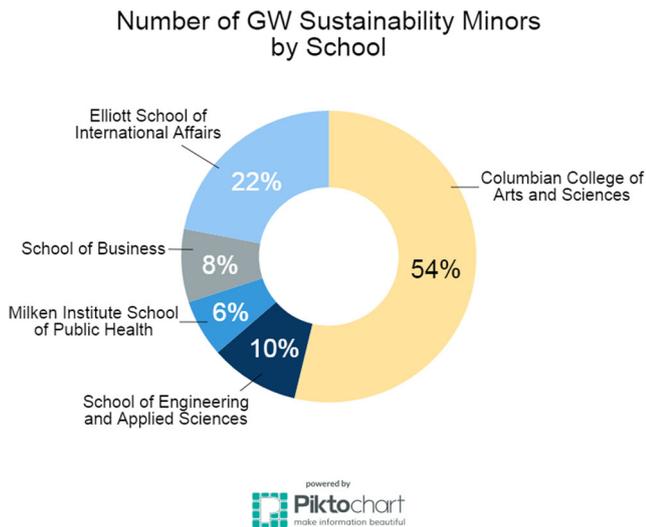


Fig. 1 Distribution of GW Sustainability Minors by school, by percentage

By 2015, only 3 years after GW launched the Sustainability Minor, every school with undergraduates had students enrolled in the minor, representing nearly every discipline (see Fig. 1). While Sustainability minors represent a small percentage of the undergraduate student body, it is nevertheless the largest minor on campus. Interestingly, while Columbian School of Arts and Sciences enrolls about 70 % of all undergraduates, it accounts for only 54 % of Sustainability Minors. The other schools have higher proportional representation. Yet it is known that humanities students are under-represented in the minor (not coincidentally, humanities Green Leaf courses are also under-represented in GW offerings). Based on the work of Barlett and colleagues (Barlett and Chase 2012), a communications strategy has been developed to attract humanities students, and faculty in the humanities have been targeted to develop new Green Leaf courses and offered course development grants.

The GW Sustainability Minor is still a very new program; the first students to graduate with the minor were in 2013. We therefore do not have sufficient data on the impact the Sustainability Minor has had on their careers. It may be some years before the impact of this program can be fully discussed. Yet, the realization of the Sustainability Minor has allowed GW to consider: in what other ways can Sustainability contribute to expanded pan-university engagement? How can more GW faculty participate in sustainability efforts? What strategies can be pursued to ensure that all students graduate with an understanding of sustainability?

Curriculum permeation

One strategy underway to further the pan-university reach of sustainability education is to have 100 % of GW departments

offer at least one course with a sustainability learning outcome/module. A longer-term strategy under consideration is to have all GW undergraduate and graduate courses integrate sustainability objectives in their learning outcomes, an ambitious task to be sure. Both of these strategies relate to the goal of having sustainability permeate the curriculum to ensure that sustainability becomes a part of the educational experience for all GW students.

Embedded sustainability learning outcomes across the curriculum is becoming a broadly embraced value (Dilafruz et al. 2014). In part, this is because increasingly, sustainability learning goals are being adopted in many disciplines. For example, the GW School of Engineering recently underwent re-accreditation by the Accreditation Board for Engineering and Technology which now requires sustainability knowledge for the baccalaureate: “an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability” (Engineering Accreditation Commission 2012; 3).

The Association for the Advancement of Sustainability in Higher Education (AASHE) evaluates how well colleges and universities are doing in sustainability education, in part, by measuring how deeply sustainability has permeated an institution’s overall curriculum. AASHE does this by assessing (a) the percentage of departments that offer a sustainability-focused or -related course as a function of the overall number of departments university-wide and (b) the percentage of sustainability-focused or -related course offerings as a function of the overall number of university courses (AASHE also evaluates the number of sustainability-focused and -related degree offerings, and the number of departments with sustainability learning outcomes). The rating system for classes and programs is acknowledged within AASHE to be flawed as there are inconsistencies in how universities self-report data due to various interpretations of AASHE data requests. Despite this, it is the most widely cited university sustainability rating system, and one that forms the basis for other rankings such as Sierra Club Cool Schools and The Princeton Review. It is also a tool used by GW leaders to benchmark sustainability efforts and to glean new ideas from colleagues in other universities to implement at GW.

To better understand the extent to which schools have embedded sustainability into the curriculum and how GW compares, data collected by AASHE and publicly available in the AASHE STARs database was analyzed. We compiled data from all colleges and universities achieving a Silver or Gold rating through August 2014. Figure 2 shows the percentage of departments offering a course with sustainability content as a function of the overall number of departments as reported

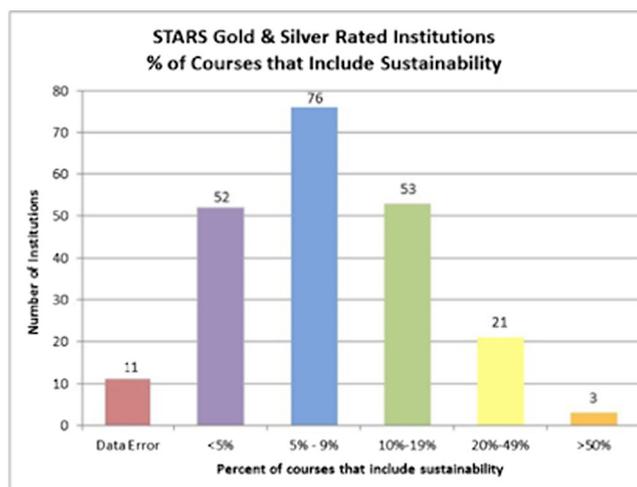


Fig. 2 Percentage of departments that include sustainability for schools with Gold and Silver ratings in STARS. Source by authors, based on AASHE reporting

by universities receiving a gold or silver rating from AASHE.

More than 100 universities claim more than half of course offerings contain sustainability content, yet this is less than 1 % of the overall number of Gold and Silver rated universities. At this writing, no school has made the claim that all courses include sustainability content, although several are close. But these high achievers are mostly small, environmentally focused colleges.

Although there are 399 GW courses with sustainability content, at such a large university this represents just over 8 % of the total courses. There is much room for improvement. At the time of this analysis, 68 % of GW departments offered at least one sustainability course. Given some effort and a couple of years, GW could be in a position to claim that all departments have at least one course related to sustainability.

Several strategies could be pursued to reach the goal of having 100 % of GW departments offer a sustainability course. From 2012 to 2014, up to \$10,000 per year was competitively awarded for sustainability course development. While these course development awards may continue in some manner, this level of funding is too little to trigger construction of many new courses and therefore this strategy alone will not quickly advance curriculum permeation. The GW University Teaching and Learning Center has agreed to host an annual workshop for faculty to help encourage sustainability curriculum, and a priority list of departments from which to target faculty participation has been developed. Finally, faculty are being urged to search out resources that make adding sustainability modules within existing courses easy.

Sustainability literacy

Another approach under consideration is to make “sustainability literacy” a requirement for graduation; this could involve

requiring every GW student to take at least one Green Leaf course. In most departments, this could be a relatively easy goal to achieve since there are so many existing Green Leaf courses from which students can select. However, there could be resistance from some who argue that students have too many requirements to fulfill already. Requiring sustainability literacy, however, would send a powerful message to all students that this is a critical knowledge area.

Universities as living laboratories

Increasingly, conversations about research and education in sustainability focus on the concept of the living laboratory—using the university and its community to provide real-life context for problem-based integration of research, teaching, and university operations. Learning labs are touted as the way to achieve transformative learning opportunities and actionable sustainability solutions.

While most of the literature on sustainability living labs is case-based rather than theoretical, efforts are underway to better describe the underlying framework. AASHE held a 3-day workshop in 2013 on “Designing a campus sustainability living lab.” The International Sustainable Campus Network (ISCN), an organization of 60 universities and colleges (of which 13 are US-based, including MIT, Yale, Harvard, Stanford, Hopkins, and Georgetown), is organized into three working tracks, with one being “Integration of research, teaching, and facilities.” That ISCN devotes a third of its work on living labs illustrates the importance this concept is taking on in the field, particularly internationally. Despite the convergence of interest around living labs, there is an important nuance in the conversation underway: some narrowly construe a living laboratory to be about facilities and learning through collaborative work on things such like energy efficiency. Other conceptions are much broader and more exciting. These conversations use living labs as a way to create a fundamental shift in education and research toward collaborative real-life problem-solving.

There is tremendous potential in the campus Living Lab concept since it breaks through the current curricular and operational paradigms to add a new model for both education and sustainability action. Living Labs have the potential to engage students, staff, and faculty in citizenship, leadership in sustainability, and to provide a service that benefits the GW campus.

Conclusion

The experience at GW has shown that there are tremendous benefits in creating a pan-university effort around

sustainability. We have seen faculty energized by new opportunities for innovations in team-teaching. And they have been recognized for it: in 2014, the five faculty teaching Sustainability 1001 received the GW Service Excellence award. Faculty are also engaged in creating interdisciplinary teams for research around sustainability; several GW faculty teams have recently received grants, including a multi-million dollar grant, to examine urban arctic sustainability in a project that involves GW faculty from three different schools. The process of creating and managing the minor has given university administrators the opportunity to learn about how to better support and advance interdisciplinary teaching and research and to think creatively about breaking down traditional institutional silos. And yet, many challenges remain. Some of the challenges are inherent to any interdisciplinary endeavor, such as the tenure and promotion process. And GW efforts have been somewhat dependent on strong, visionary leaders and their commitment to sustainability. What might happen should these leaders leave the university? Other challenges may be unique to the pan-university effort. These include being outside of any school (and hence feeling homeless), lack of a clearly demarcated budget line and governance structure, and the fact that conventional fundraising efforts prioritize efforts at the school level. GW is challenged by both interdisciplinary and pan-university structural issues, but we are confident that the benefits of sustainability as a pan-university collaboration are worth the difficulties.

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The process of creating the Sustainability program involved numerous internal reports, documents, and memos. Many were intended for an internal audience. In addition, some of these documents are now out of date and we do not have them posted on the GW website. If you would like to learn more about the process and development of the Sustainability program and the Sustainability minor, please contact the authors.