Creating an Interdisciplinary Introduction to Sustainability Studies Course

Charles Thomas,
School of Engineering, Computing and Construction Management
Roger Williams University

Loren Byrne,
Department of Biology, Marine Biology and Environmental Science
Roger Williams University

Jeremy Campbell
Anthropology and Sociology Department
Roger Williams University

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Abstract

The general consensus among institutions of higher education is that for a course in Sustainability Studies to be successful it must treat the subject in a transdisciplinary manner. The authors (an Engineer, Ecologist, and Anthropologist) have collaborated to create and deliver a course titled "Introduction to Sustainability Studies." It will become the introductory course in the minor in sustainability studies at Roger Williams University. The students in the course were from many different majors (for example: Criminal Justice, Architecture, Biology, although no Engineering majors were enrolled), and ranged from freshman to seniors. The content of the paper will describe the genesis of the course and the manner in which it was delivered in a transdisciplinary way to such a diverse audience. It will also describe the engineering content, and the attempts made to deliver it to a non-engineering audience. Finally, some lessons learned from teaching this course will be offered that might be of use to others attempting such a course.

Introduction and Background

With the recent approval of a Sustainability Studies Minor at Roger Williams University (RWU), sustainability has begun to have an impact not only in campus operations, but on the formal curriculum as well. The effort to create a minor started in the Fall of 2008 when a group of faculty from many different disciplines formed an ad-hoc committee to look into including sustainability more formally in the curriculum. While graduate degrees and a major were considered, the most appropriate program was identified to be a minor.

Throughout the planning process, careful attention was paid to making sure the program did not become too focused on any one discipline, so that it will be possible for students from many different majors to complete the minor. The minor is composed of three newly created, required courses (Introduction to Sustainability Studies, Analysis and Decision Making for Sustainability, and Working Towards Sustainability), and three elective courses. The electives are chosen from among existing courses which contain a significant focus on sustainability issues, and come from a wide range disciplines. We expect that courses will be added in the future as more and more attention is paid to sustainability by faculty. The balance between required and elective courses was struck to limit the number of new courses needed and to encourage the inclusion of sustainability issues in existing courses so that they might be added to the list of approved electives. In addition, this balance will allow more students to partake in the minor because they can use courses from their majors as part of the minor.

The focus of this paper is on the first of the newly-created required courses "Introduction to Sustainability Studies." The initial offering of this course was in the fall semester of 2009, and it was co-designed and co-taught by the authors. A description of the planning process and delivery of the course is given in a following section. First, we present results of a survey of similar introductory courses for minors at other institutions.

The Association for the Advancement of Sustainability in Higher Education (AASHE) keeps a list of sustainability programs of its member institutions[1], including a list of minors. It is this list on which we base our survey. Certainly it is not an exhaustive list (for example, since RWU is not, as of this writing, a member of AASHE, our program does not appear there), but we consider it a good indication of what types of programs are in existence throughout the U.S.

Of nineteen the programs listed, about half include an introductory course like the one at RWU. The programs without an introductory course lack one because they are not intended to be transdisciplinary in nature. Instead their focus is on how sustainability relates to a particular field (for example, the Sustainable Science and Policy Minor at Clarion University of Pennsylvania). By investigating the introductory courses, a general picture of the typical course format emerges: the topics include (but are not limited to) sustainability in social, economic and energy contexts; they are often taught by multiple instructors who utilize relevant guest lecturers; and they are housed in academic units outside a well-defined traditional discipline such as in a center for "sustainability or interdisciplinary studies." With some exceptions (for example the University of the Pacific) most of the programs are typically offered by faculty from disciplines traditionally associated with Art and Sciences, and do not include faculty from professional schools such as Engineering.

RWU Course Description

At RWU, the introductory course in the sustainability studies minor is SUST 101 – Introduction Sustainability Studies. For its first offering, it was co-designed and team-taught by the authors in the Fall of 2009. The initial planning and organization of the course took place in the summer of 2009 with continued development of lesson outcomes, activities and assignments through the fall semester. During this time the main text was selected (The Myth of Progress by Tom Wessels[2]), as well as other readings. The content delivered in the course was organized in to four sections, roughly following the sections in the Myth of Progress: (1) Introducing Sustainability Studies, (2) The Science of Sustainability, (3) Sociocultural Contexts and (4) Towards Solutions. We describe the topics and examples of student work included in each of these sections below.

Introducing Sustainability

To give students an opportunity to come to a deeper understanding of what sustainability really is, we started the course by giving them an opportunity to personally explore their world views and learn about the prevailing socioeconomic paradigm of the United States (i.e., unlimited economic growth reflected by an ever-increasing GDP). We also explored the sometimes subtle difference between "belief" and "knowledge." In support of this lesson, the major coursework component was for the students to pick a sustainability-related belief that they held and write a "This I Believe" essay, modeled after the long-lived project started by Edward R. Murrow in the 1950's and continued today by National Public Radio[3]. This introductory section also included lectures whose purpose was to present a common definition of sustainability which was referred to throughout the remainder of the semester.

The Science of Sustainability

After defining sustainability, we examined it through the eyes of the natural sciences – mainly Biology/Ecology and Physics. To begin, we explored what *science* is, and what constitutes a scientific approach to understanding the world. Following that, we presented the concept of "systems thinking" and how it applies to ecosystems, populations, food webs, the definition of life and biophysical limits to growth of these entities.

With the foundation laid in biological sciences, we turned next to the physics of energy, specifically how it applies to ecosystems and to issues of energy generation and use in social systems such as the United States. This section of the course concluded with a discussion of how energy generation from fossil fuels is connected to global climate change. In this section of the course, students were asked to write papers which demonstrated their understanding of the science of sustainability, as presented in the *Myth of Progress.*

Sociocultural Contexts

Unfortunately, students (and frankly most people) probably do not first identify themselves as living in an ecosystem; instead we see ourselves as part of largely human-created systems, such as the economy and all of its associated architecture. The third section of the course was an attempt to (at a minimum) make the students aware of this, but hopefully to also encourage them to change their behavior. In this section, the class explored, among other topics how democracy is often challenged by corporate power, the concept of consumerism, and the history of societal collapse (with an eye towards drawing comparisons to the society in the US).

Toward Solutions

We next turned toward presenting a series of solutions to major issues related to creating sustainable socio-ecological systems. The intent was to present solutions both on a cultural-national scale and an individual scale. An example lecture was on how "progress" in society should be defined. In his book, Wessels, argues that the current definition is that of increasing the GDP of the country and thus that progress is purely economic in nature. In the lecture, the students are encouraged to consider alternate definitions which include environmental and social issues in addition to economics, and to even *apply* that definition to themselves and their larger communities. Clearly defining and implementing new notions of progress is a "cultural-scale" concern that will only bear fruit if a new definition is adopted by a large percentage of the population. Other topics included in this section of the course included food production and consumption, water management, biodiversity and ecosystem conservation, green design of buildings, and environmental traditions in art and literature. Assignments in this section of the course included a research paper on a currently identified "problem" and solution in sustainability studies. Students were also asked to complete a "creative project" to highlight some aspect of sustainability that influenced them in a personal manner. These projects ranged from a vocal performance to paintings to series of poems, all with sustainability-related themes.

Course Delivery/Audience

Most parts of the four sections of the course were delivered by one of the authors, but for those topics which were clearly outside our training, we enlisted the help of guest lecturers from departments across campus. For example, a geologist who studies climate change presented a lecture about that topic and a mass media communications expert led a discussion about the latent messages in commercials as they relate to consumer culture. In addition to providing the students an opportunity to learn from experts in these fields, our hope was that this practice allowed the guest lecturers a chance to teach what they find important with respect to sustainability.

As mentioned previously, our course contained a highly diverse population with respect to major and grade level. As a result, we walked a fine line in being too discipline specific and in

presenting ideas too complex for some students to fully understand. To attempt to more effectively deliver material to this diverse audience, we used a variety of teaching methods: traditional lecture, in-class discussion, in-class writing exercises, multi-media presentations, and breaking into smaller sections of approximately 15 students each when the subject warranted it. This diversity of pedagogical approaches was appreciated by the students as it helped create a more dynamic and engaging course.

For the most part, the three authors were present for all of the lectures. One goal of this co-teaching arrangement was to model for the students the type of discourse that can and does occur between professionals of different disciplines. Thus at times, if one instructor was lecturing and another, in the audience, had a question or something to add, time was taken to address it completely. This arrangement also allowed the students to see instructors as "students" in disciplines other than the ones in which they are trained. The underlying message we trying to convey is: always consider yourself a student, even after graduation.

Engineering Content

The engineering content presented in the course (which for the purposes of this paper is defined as those lectures delivered by the engineering faculty (CRT), ranged from quantifying energy use to Life Cycle Assessment, to an introduction to the formal Engineering Design Process. Given that there were no engineering students enrolled in the class, we felt this was an opportunity not only to teach concepts traditionally identified with engineering, but to also present to the students what it is that engineers do (a question that is often difficult for non-engineers to answer).

As might be expected, if there was one aspect of the engineering content to which students were less than receptive, it was the use of mathematics in making an argument or describing a process. However, mathematics cannot be completely ignored when presenting some ideas. For example in a lecture about energy, the students were carried through a calculation of the amount of heat energy stored in a solar hot water tank. Judging by the some students reviews on end-of course assessment, it seems the students can appreciated the importance of mathematics, although they tend to avoid using it.

In some cases, mathematics can be ignored to get an essential point across, as in Life Cycle Assessment (LCA)[4]. While in a traditional sense LCA is a quantitative technique to study the total impact a product or service has on an ecosystem, for example, it can be turned in to a qualitative exercise of listing those impacts. For example, in class we discussed the LCA of a box of cookies. Students were asked to identify the necessary sub-steps in the production, use and disposal of the cookies starting with the harvesting of the wheat and extraction of oil to manufacture the packaging to eating the cookies and throwing into the land fill of the empty package. As such, the LCA is a valuable pedagogical framework for helping students "connect

the dots" with regard to the many dimensions of our consumer culture. This is a pre-requisite for helping identify sustainable solutions for increasing energy efficiency and waste disposal associated with manufacturing and consuming goods.

Lessons Learned

Based on observations made during the semester and from comments offered by students when asked for their feedback at the end of the semester, we identify several lessons learned from our first semester of teaching a transdisciplinary sustainability studies course. Some are reflections on the students, while others reflect our presentation of the course content. We also suggest how to address each of the lessons.

As alluded to previously, many of the students (but not all), while appreciative of the "culture-based" solutions presented, were looking for solutions that they could immediately implement themselves. Perhaps our intent of teaching them how to judge different solutions for themselves and then select ones that make the most sense was too ambitious. Perhaps in this sort of course, we should abandon the standard "academic disinterest" in teaching and focus on "long term change" and begin to push for changing the everyday *behavior* of the students in the class. However, this could be viewed as risky because students may not respond well to didactic instructions for how to change their lifestyles. This reflects a central concern about how to alter people's behaviors in society more widely.

Also, as alluded to previously, the audience was diverse in both major and academics level. At the end of the course, it became apparent that student success was more closely tied to academic level than to major. One specific indication of this was that the group of freshman in the course, on average, did not earn grades as high as the non-freshman. Ultimately, we think a change in the enrolment requirements are in order: the course will be open to upperclassman or with the consent of the instructor. It seemed that, although this was an introductory course, deeper engagement with the complex, synthetic content requires more mature thinking, not always possessed by first-year students.

In future offerings of the course, we will need to pay more attention to the delivery of math-based content. None of the math which was required of the students was more advanced than high-school algebra, yet for some it proved difficult to master. We feel strongly that math cannot be dropped completely, and there is little time in lecture to cover basic math skills. Possible solutions to this concern include placing problems in a more student-friendly and applicable context or providing more opportunities for practice via homework problem sets.

Conclusion

The new minor in Sustainability Studies at Roger Williams University was formally approved in March 2010 and several students have already been contacting us to enroll in it. For students completing the minor, we expect the introductory course described above to provide an effective

transdisciplinary overview to the many concepts that underpin a broad understanding of this new area of scholarship. Team teaching this course the first time it was offered was absolutely essential for developing a more effective syllabus and assignments – the topics included in the course demand knowledge and experience in a wide range of subjects too broad for any one of us to have dealt with in a competent manner alone. With this arrangement, students obtained the benefit of a wide variety of viewpoints, as did the instructors. In fact from the viewpoint of the instructors, co-development and co-teaching this course offered each of us a unique and valuable professional development experience that has positively impacted each of our individual classrooms. Our three distinct disciplines (engineering, biology, anthropology) combined nicely to allow us to offer a more complete picture of introductory sustainability studies issue to the students. Thus, we recommend that others who wish to develop a transdisciplinary program in sustainability studies also engage with faculty from different disciplines to create a more dynamic and content-rich set of courses.

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Biographies

Charles Thomas, Ph.D.

Dr. Thomas graduated from the University of Rochester with a B.S. in Physics (98), and an M.S. and Ph.D. in Mechanical Engineering from Boston University in 2004. Following graduation from B.U. he was a postdoctoral research fellow at there, where he taught and carried out research on the effects of cavitation during high intensity focused ultrasound insonation. He has

taught at Roger Williams University in Bristol, Rhode Island since 2005, becoming increasingly interested in sustainability in the curriculum.

Loren Byrne, Ph.D.

Dr. Byrne is an urban ecologist studying the effects of lawn and garden management on terrestrial ecosystems. He earned his B.A. in Ecological Artistry from Hiram College, OH and a Ph.D. in Ecology from Penn State University in 2006. In 2007, he joined the faculty of Roger Williams University where he teaches a diverse set of ecology, environmental science and sustainability studies courses.

Jeremy Campbell, Ph.D.

Dr. Jeremy M. Campbell is a political and environmental anthropologist whose work focuses on colonization and frontier ecologies in the Brazilian Amazon. He is a graduate of Davidson College (B.A., 2002) and the University of California, Santa Cruz (PhD., 2009). In addition to teaching courses on sustainability and cultural comparison, Dr. Campbell is currently finishing a book on land speculation, rural migration, and environmental governance in Amazonia.