2018

DOMES Curriculum Description

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Designing Open Modules on Environmental Sustainability (DOMES): Curriculum Description

INTRODUCTION

As a concept that is inherently interdisciplinary, sustainability in the college curricula is often stifled by the limitations of disciplinary boundaries. While some models exist that incorporate perspectives on sustainability from multiple disciplines into specific courses (see Hamilton, et al. 2010), the Designing Open Modules on Environmental Sustainability (DOMES) Project connects multiple disciplines in a flexible way (versus in a prescribed curriculum) as well as provides a framework for students to construct personal philosophies for sustainable decision-making.

Modules are designed to be free-standing, that is, they are able to be adapted into courses that are not explicitly about sustainability. The design of our project is inspired by the structure of Multidisciplinary Sustainability Education (MSE) at Ithaca College (Hamilton, et al. 2010), which allows for the creation of a student-generated body of knowledge that is shared across courses and not dependent on pre- or co-requisite enrollment in specific STEM (science, technology, engineering, and math) courses. The DOMES project modifies the MSE structure by expanding beyond a STEM focus to include the social sciences and humanities.

In addition to applicability across disciplines, a second feature of DOMES is an emphasis on how interdisciplinary knowledge informs personal decisions about a range of sustainability topics. Students in one course create products using the conventions of that discipline. Then, students use student products from other disciplines (e.g., biology and political science) to reflect upon their personal lifestyle choices.

GUIDING PRINCIPLES OF OUR CURRICULUM DESIGN

We developed our curriculum with the content and design principles that we learned at the 2017 Finger Lakes Project workshop. Our goal is to continue to gather and share content emphasizing all three sustainability knowledge domains (environmental, economic, and social), with the overall mission of instilling a civic responsibility of local, regional, and global stewardship. We utilize backwards course design and evidence-based pedagogical strategies—including data-driven curricular revision—to achieve student learning at multiple cognitive levels.

Education for Sustainability goals

A key outcome of DOMES is for students to engage in a personal reflection about how to integrate sustainability into their everyday lives. This emphasis on personal reflection informed our decision to initiate our project with a module on food sustainability, since food is a tangible good that affects everyone, everyday. The element of personal reflection central to our project allows us to pursue the _Education for Sustainability_ goal of encouraging students to "be caring citizens who exercise their rights and responsibilities locally, nationally, and globally" (UNESCO 2005). Our hope is that as students learn about the impact of their food choices, and reflect upon how those choices coincide with sustainability at multiple levels, they will put some of their knowledge into practice in deciding what they eat. In addition, our focus on food sustainability

enables us to foster the *Education for Sustainability* goal of learning to "live in a world where all people have sufficient food for a healthy and productive life" (UNESCO 2005). By placing food systems in the larger contexts of local, national, and global sustainability, students will learn how their individual food choices impact much more than diet. Ideally, the various components of our food sustainability module will encourage our students to "appreciate the wonders and people of the earth," particularly as we engage them in place-based learning, and provide them with new experiences and perspectives on the importance of food to people, the economy, and the environment (UNESCO 2005).

Sustainability knowledge domains

By developing shared content applicable to each course, such as in our first module on Food Sustainability, we ensure that students gain foundational knowledge about sustainability and the interconnectivity of the social, economic, and environmental realms. Furthermore, the interdisciplinary nature of our modules ensure that no one realm is neglected. For example, political factors (including social and economic conditions) will be emphasized in Global Environmental Politics, but the products produced by the Principles of Ecology students will ensure that the scientific nature of environmental impacts will not be ignored.

Alignment to best practices in teaching

We have used the principles of backwards course design (Wiggins and McTighe 2005) and scientific teaching (Handelsman et al. 2007) to develop our curriculum, and use student performance data to assess and revise the curriculum in future iterations. Our common and specific learning outcomes motivate the formative and summative assessments that we utilize. The assessments in turn determine the shape of activities in class and homework assignments. In these activities and assignments, students will have low-stakes opportunities to practice skills and apply knowledge in ways that prepare them for the high-stakes assessments. Importantly, the active-learning and cooperative peer learning activities that we have chosen within and across courses have been shown to be effective with diverse students and learning environments (e.g., Freeman et al. 2014).

Range of pedagogical strategies

As can be seen in the Food Systems module, this curriculum employs several pedagogical strategies to achieve our learning outcomes that align with the diversity of lower and higher-order critical thinking skills (Krathwohl 2002) of our curriculum. Within each course, each instructor will use a variety of teacher- and learner-centered methods. For example, we complement assigned readings, videos, and short lectures with cooperative learning activities such as brainstorming, think-pair-share, and jigsaw problems. However, across courses, the pedagogical strategy utilizes guided inquiry (Kuhlthau et al. 2012) to accomplish the penultimate common learning outcomes for each module: e.g., Food Sustainability: Justify personal decisions about food choices using evidence from multiple sources. Although developed for the K-12 setting, the steps of guided inquiry—Open, Immerse, Explore, Identify, Gather, Create,

Share, Evaluate—remain appropriate for the undergraduate level. For example, in both Principles of Ecology and Global Environmental Politics, the Food Systems module engages students with a sustainability issue (food system sustainability) that connects to everyday life (Open). Students then focus on the disciplinary content needed to address either ecological or political components of sustainable food systems (Immerse). In small teams, students then choose a claim about sustainable food choices to evaluate using their disciplinary knowledge (ecology or political science; Explore, Identify). Each student team generates a written product using the conventions of each discipline to synthesize its findings (Gather, Create). These products are then curated in Geneseo's KnightScholar collections (Share). Finally, each student reflects upon personal food choices based on what was learned from the shared materials generated by fellow students (Evaluate). As this curriculum is expanded to other disciplines, we envision products will be assigned as is appropriate for each discipline (e.g., narrative writing, paintings, etc.).

SUMMARY AND CONCLUSIONS
The flexibility of the module design and the universality of common sustainability learning outcomes permit any course in any discipline to participate and contribute to this collaborative learning community. Because of the wide applicability and broad inclusivity of disciplines of our larger project, our project aligns not only to sustainability education goals but also supports the SUNY-wide initiative to make applied learning with a reflective component available to all students. We are excited to create this collaborative, interdisciplinary network for sustainability education, and welcome the contributions of instructors who are interested in bringing sustainability into more educational settings.

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