

Faculty Development for Environmental Sustainability in Higher Education

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". . . universities bear profound responsibilities to increase the awareness, knowledge, technologies, and tools to create an environmentally sustainable future."

--The Talloires Declaration

Many scholars and activists in recent years have called for substantive reform of higher education aimed at transforming colleges and universities into institutions that model, seek, and teach the values of environmental sustainability. While many of these calls for reform address directly the ways in which colleges and universities use resources, handle waste, and keep their own campuses "green" (Eagan and Orr, 1992), others suggest that we also need to rethink curricula and help students attain the skills, knowledge, and values that will move us closer to creating a more sustainable society (Orr, Collett and Karakashian, Workshop). If we are to make the kinds of curricular changes that will help us achieve these important and ambitious goals, faculty members in all disciplines across our campuses will have to change the way they conduct research, teach their courses, and design larger curriculum projects. One key, then, to this transformative project is addressing and effecting faculty attitudes through faculty development.

At Northern Arizona University, as part of a broad-based initiative aimed at addressing environmental issues, we have engaged in reform efforts through a faculty development program called the Ponderosa Project. Our aim is to help faculty from across campus revise their courses to include issues of environmental sustainability. Our goals in this program have been (1) to help faculty understand how the concept of environmental sustainability is related to their discipline, (2) to help them consider how these concepts may impact their teaching in positive ways, and (3) to help them integrate these ideas into their courses. In this article, we will describe this faculty development program at Northern Arizona University thus far, offer some comments on the results of what we have done, and suggest some of the directions we plan to pursue in the future. We don't offer this model as the

only way to achieve reform in this area, but as one example of how we might proceed.

The Setting

Northern Arizona University (NAU) is a mid-sized, state-supported institution located in Flagstaff, Arizona. Primarily a residential campus with 16,000 students, NAU has also been charged with meeting rural needs statewide, and thus serves an additional 5,000 students at off-campus sites. Students attending NAU come from a broad cross section of the socioeconomic scale and represent several ethnic populations as well. Like Kerr's multiversity, NAU is comprised of different schools, colleges, and programs: the College of Arts and Sciences, Social and Behavioral Sciences, Engineering, Hotel and Restaurant Management, the College of Ecosystem Science and Management, the School for the Performing Arts, the School of Communication, the Center for Excellence in Education, and the School of Health Education and Allied Professions. Thus, NAU is like many state universities at this time. It is complex, diverse, multifaceted, and working daily to meet the needs of students from diverse backgrounds.

No two universities are exactly alike and NAU has its own traditions and commitments that set it apart from many other institutions. Among these, partly as a result of its geographical location on the Colorado Plateau, 7,000 feet above sea level, is the commitment to address environmental issues and to provide students and citizens of the Colorado Plateau with information and expertise on the region. Moreover, the university, because of its location, tends to attract students who are interested in outdoor recreation: mountain biking, skiing, hiking, camping, backpacking, rock climbing, and river running.

Several events that occurred in the early 1990s laid the groundwork for the faculty development workshops. In 1990, the state adopted a wide-ranging Environmental Education Act that outlined responsibilities for nearly all state funded agencies including the state universities. In 1992 a university-wide task force was appointed to examine the state of environmental instruction at NAU. This task force later issued a report calling for increasing teaching about the environment throughout the university. During the same year, the university reported its progress in implementing the Environmental Education Act at the Environmental Education Mini-Summit in Phoenix. Then, in May 1993, during the signing of a memorandum of understanding with the United States Environmental Protection Agency then NAU President Eugene Hughes announced that NAU would be the environmental university in the region.

While these activities were occurring the university was simultaneously engaging in curriculum development in the environmental sciences and engineering as part of a group known as the Historically Black Colleges and Universities/Minority Institutions Environmental Technology Consortium. In 1993, the consortium shifted its direction towards the greening of the curriculum outside the sciences and began a series of training workshops that were provided by Second Nature to, "make environmental and developmental issues an integral part of all the disciplines . . . and to practice environmental stewardship on campus and in the surrounding communities." It was significant that NAU was selected as one of eight members of the consortium to participate in this venture as the activities were first practiced in public at NAU during the consortiums annual curriculum development meetings. This meeting exposed the NAU administration to the idea of interdisciplinary curriculum "greening" workshops.

Finally, a critical piece of implementing the workshops was the key support of a high-level, well-respected, administrator who was willing to provide substantial financial support for initiating faculty development for sustainability.

Faculty Development for Environmental Sustainability

In the winter of 1995, after several faculty at the university had attended workshops on environmental sustainability sponsored by Second Nature, a core group embarked on establishing a faculty development program aimed at helping faculty across campus revise their courses. Selected faculty were invited to take part this first project. Faculty who did take part and who revised their courses received a stipend of \$1,000 when they submitted their revised syllabi. The first set of these development workshops was held in May, 1995, in the week following commencement. We established these as two-day workshops, held off campus, during which a group of twenty faculty met with outside resource experts and worked with small groups of colleagues to consider how they might alter their courses. Knowing that we would be working with faculty from a broad range of disciplines, we brought in resource experts who also represented broad interests. Thus, in the first year we invited people to talk about environmental justice, biodiversity, economics and the environment, and forestry in northern Arizona. In subsequent years, we have varied the themes, or topics, slightly, and we advertised broadly across campus to attract other faculty to the project.

Our goals in these workshops has been to help faculty think about sustainability in relation to their discipline, to their own expertise, to the content they chose to teach, and to the pedagogy they employed. We have

been concerned, too, that faculty move to rethink their work in relation to a larger university context and mission aimed at addressing issues relating to the environment and to questions of sustainability. We did not have a program, or a plan, to suggest to these faculty. Instead, we wanted to see what faculty did with the workshops and we wanted them to determine the results. Thus the underlying assumptions driving all of these workshops have been: (1) faculty benefit most from being presented with a broad range of approaches, ideas, and resources; (2) education for sustainability is linked to content and pedagogy--how we teach is as important as what we teach; (3) faculty themselves know best how to revise the courses they teach; and (4) one way to help faculty move toward sustainability is to provide opportunities for them to step outside of the narrow boundaries of their disciplines and departments, to talk to each other, to share ideas and insights, and to see themselves as essential participants in a larger project. Finally, we were impressed with the creative, enthusiastic, and energetic ways that faculty approached these workshops. We were equally impressed with the changes they proposed and implemented in their courses.

The Workshops

The schedules for each of these days were designed to provide information and ample time for discussion, workshops, and informal activities. The outside experts made presentations that lasted only thirty minutes, and they spent the bulk of their time working with small groups of faculty. And, faculty spent a good deal of time talking to each other. Thus, though faculty heard presentations on a range of subjects, the time for these presentations was balanced throughout each day with discussions, workshops, and interactions in small groups. At the conclusion of the two-day workshop, faculty departed with the task of revising their syllabi over the course of the summer. During this time, they were free to conduct research, to do more reading, and to consider questions of content and pedagogy as they revised their syllabi. In August, just before the start of the academic year, faculty who had taken part in the workshops in May reconvened, without resource experts, to share with each other the work they had done and to present their syllabi and courses to each other.

The response from the faculty--drawn from such diverse disciplines as biology, philosophy, history, political science, Spanish, education, hotel and restaurant management, psychology, business, Navajo, and English--was overwhelmingly positive both at the conclusion of the two-day workshop and when we reconvened in August. Faculty spoke highly of the resource experts, but their highest praise was for each other and for the opportunity to move outside their own disciplinary boundaries to work with faculty from across campus. Of the twenty faculty who enrolled in the workshops,

eighteen turned in revised syllabi and a small number of faculty continued to meet throughout the year to discuss the progress of their courses. We considered this first year of the Ponderosa Project a success.

In terms of faculty development, the results of these workshops, which we have now conducted for three years, have been extremely positive. As noted earlier, faculty are grateful for the opportunity to work with each other and to cross disciplinary boundaries. Beyond this, however, other benefits accrue as well. Faculty see these workshops and the work they do over the course of the summer as good opportunities to learn more about environmental sustainability. Just as important, they also pursue the challenge of thinking about environmental sustainability from the perspective of their own disciplinary training. Thus, the workshops not only provide more knowledge, they also provide opportunities for faculty to rethink their own expertise. In subsequent years, the energy has been just as high and, in fact, the project is clearly gaining momentum. Twenty two faculty--drawn from political science, mathematics, English, nursing, chemistry, business, communications, art history, biology, hotel and restaurant management, geography, sociology, and criminal justice--took part in our most recent set of workshops. To date, sixty faculty at Northern Arizona University have revised their courses as a result of this project.

Teaching for Sustainability

In the Report of the Workshop on Principles of Sustainability in Higher Education (1995), the authors argue that,

"the foundation of education and research must be interdisciplinary, systems-oriented thinking that will address environmentally sustainable development on local, regional and global scales over short, medium and inter-generational time periods. Rather than being isolated in its own academic discipline, education about the environment, natural resource management and sustainable development must become an integral part of the normal teaching in all disciplines."

The challenge for faculty attending these workshops has been to determine how they would respond to these goals. How could they be more interdisciplinary, engage in systems-oriented thinking, and how could issues of environmental sustainability become an integral part of their teaching? What has been exciting for us is to see how faculty rose to these challenges and to learn how they answered these questions.

Faculty have significantly altered their syllabi and their teaching as a result of these workshops but they have chosen to do so in a variety of different

ways (see appendix for an overview of these courses and the changes). The changes that faculty have made in their courses represent a broad range of possibilities:

- some faculty use environmental issues as examples in their courses;
- some have introduced environmental content directly;
- some have consciously changed their orientation so that students are regularly reminded that the material they are addressing is linked to visions of sustainability; and
- some have created class or individual projects that address environmental concerns.

These changes led faculty to change *what* they taught and, just as importantly, *how* they taught. To provide a clearer picture of these creative changes, and of the possibilities for a range of faculty, we will provide brief descriptions of a course in the humanities, the social sciences, and the natural sciences: Medieval Art, Introduction to Anthropology, and Organic Chemistry.

Medieval Art (ARH 343) - Dr. Alyce Jordan: This course focuses on Western European painting, sculpture, and architecture from c. 350 to c. 1350. The revised version of this course includes medieval and contemporary readings which focus "on the relationship of western medieval culture to its environment and [which] have been selected to highlight the ways in which western medieval culture manifested an awareness of and a connection to the natural world." Some of these readings--nature poetry of St. Francis, bestiaries, herbals, and "health handbooks"--demonstrate an acute awareness of the ways in which plants and herbs could be used to treat common afflictions. In other parts of the course, students are led to consider early efforts at reforestation in thirteenth-century France which came in response to rapidly diminishing resources as wood was being harvested to support the production of stained glass windows, an art form that required extended firing at high temperatures.

The course also draws attention to the threats that modern pollution poses to the art and architectural monuments that are the legacy of medieval culture. Finally, students are asked to make explicit connections between the medieval world and contemporary society through a reading of *The Temptation of St. Ed & Brother S.* (Bergon, 1993). In Bergon's novel, the spiritual life of St. Ed and his followers is threatened by the installation of a nuclear waste storage facility which is being built near the site of the monastic community they have established in the desert outside of Las Vegas, Nevada. The goal of this assignment is for students to understand the continued prevalence of medieval Christian institutions and values in

contemporary society (and literature), and to focus their attention on a fundamental environmental issue in ways which are particularly relevant to southwest culture and geography.

Introduction to Archaeology (ANT 250) - Dr. George Gumerman: In this course, students focus on the Black Mesa Archaeological Project in northeastern Arizona as a way of beginning to understand the goals, aims, methods, and theories that shape archaeological research. The course has been revised so that the Black Mesa Project has become an opportunity to raise issues such as sustainability, environmental racism, environmental degradation, and overpopulation. In addition to attending lectures, "students work in small groups to discuss the following suppositions: (1) substances from the earth's crust must not systematically increase in nature; (2) substances produced by society must not increase in nature; (3) the physical basis for productivity and diversity of nature must not be systematically degraded; and (4) there must be just and efficient use of energy and other resources (Erikson and Karl-Henrik 1991, Hawken 1995)."

Students in the course also write a paper in which they examine how prehistoric humans may have perceived their relationship to nature and to the environment, and in other discussions address the impact of mining carried out by Peabody Coal on Navajo and Hopi Indians. In addition, students in the course examine how prehistoric humans modified the environment in which they lived, and contemplate how those modifications might have been connected to overpopulation and environmental degradation. Finally, this revision includes not only the addition of new material, but also new teaching methods. Whereas the primary pedagogy used to be lecture, students now engage in in-depth discussions as a way of learning to think critically, to evaluate a range of opinions and issues, and to consider, through a study of the past, their roles in a sustainable future.

Organic Chemistry (CHM 235) - Dr. John MacDonald: Traditionally, little emphasis has been placed on helping students become aware of environmental issues related to organic chemistry. In this course, however, environmental examples are used to demonstrate some of the key concepts and ideas of organic chemistry where relevant. For example, students focus in lectures and through additional readings on several topics related to environmental sustainability: (1) the disposal of organic waste generated by industry, academic institutions, and privately; (2) the manufacture and use of fertilizers and pesticides; (3) remediation of heavy metals from water and soil; (4) clean up and disposal of petroleum spills on land and in the ocean; and (5) the design and manufacture of organic materials and alternative sources of fuel, and for collecting and converting solar energy to electricity. Thus, though the course is designed primarily to provide students with the

fundamental chemical concepts and principles governing the reactivity and physical properties of organic molecules, students also come into contact with issues of environmental sustainability.

In one sense, these courses typify the kinds of changes most faculty have made in their teaching as a result of the Ponderosa workshops. These faculty have found that focusing on issues of sustainability does not mean giving up vital content. Rather, focusing on these issues is a way of making material immediate and relevant to student experience. The interdisciplinary and systems-oriented approaches in these courses have been ways of helping students connect with the material and to understand that their learning is connected to the larger problems they face as students and that they will face as citizens throughout their lives.

It has been interesting to see that faculty who have reoriented their courses have also in some instances changed their pedagogy. Once the connections between their own discipline and issues of environmental sustainability became clear, they work to help students explore those connections in terms of their individual experience. As a result many of the courses that have been revised make greater use of discussion, additional and related readings, and assignments which ask students directly to draw connections between their lives, their experiences, the world in which they live, and the material of the course.

Next Steps

Throughout this project, our assumption has been that no one course or set of courses needs to bear the entire burden of presenting students with issues of environmental sustainability. To do so would, in fact, run counter to another assumption which is that one of the reasons we face the issues we do is precisely because we have operated for too long with the belief that environmental problems can be narrowly defined and addressed from limited perspectives. Our long-term goal has not been to revise individualized courses but to change the institutional landscape so that the threads of environmental sustainability are woven throughout the undergraduate curriculum.

The faculty development part of this project has been very successful and we plan to keep moving in this direction. At the same time, faculty development is only one aspect of changes which may lead to institutional reform. We have come only part of the way. We now need to add a second component to our project, and to begin to look more closely at student learning. We know that we have sixty faculty who have gone through our workshops and who have revised, collectively, over a hundred courses. But,

as anyone who has taught knows, a syllabus is only a conceptual map to indicate where it is hoped students will travel in a given course. A syllabus does not measure where students have been or what benefit they received as a result of their travel.

In the next phase of this project, then, we will move to consider questions of assessment. Through focus groups and surveys we hope to determine more specifically what students are getting from these revised courses. Our goal will be to focus on issues of environmental sustainability, and to determine what difference, if any, these courses are making in the way that students think about environmental issues. Here again, we will be looking to find out what students know; that is, what they have learned in terms of content, and to see if they think differently about this material. We want to know what they know, and to consider how they think about what they know.

The third aspect of this project involves curricular and institutional change. Underlying these workshops and this project was the conviction that issues of environmental sustainability are too vast, multifaceted, and complex to be addressed from only one perspective or discipline. Moreover, we were convinced that these problems were to some extent epistemological and that it was imperative for all faculty to consider not only how their own courses addressed issues and problems, but also to consider how their courses worked in a larger context and in relation to other courses and to the university curriculum. Another goal behind these workshops was to have faculty involved in the process of revising their syllabi, begin to address larger issues of curriculum design and implementation. Our hope is that as a result of faculty development, which will be reinforced by an examination of student learning, we will be able to put into place institutional reforms that will mark out new directions for higher education. Our efforts in faculty development have already resulted in a liberal studies proposal which has at its core a commitment to help students become environmentally literate. This kind of institutional change, after all, needs to be our ultimate goal.

The Ponderosa Project at Northern Arizona University has been successful, but it is only one set of steps in the right direction for our university. We also need, as Second Nature argues, to alter university and college operations to become models of sustainable communities, and to increase university outreach to include all cultural constituencies (Second Nature, 1997). What the Ponderosa Project demonstrates, however, is that faculty development with these larger goals in mind can lead to substantive change that invigorates faculty teaching at the same time that it helps students understand the importance of their roles in determining our future.

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Course Modifications as Reported by Participants in the Ponderosa Faculty Development Project

(Partial List)

Course	Change in Orientation	New Assignments	New Required Readings
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International Politics - POS 380	Addition of two new units: International Politics and the Environment, and Industrial Development and the Challenge of Sustainability. "The concepts of sustainability and harmonious interaction with the environment are inextricably linked to the basic definition of public relations. I anticipate that nearly every class period I will draw on some environmental example of how organizations interact with and depend on a favorable/healthy environment."	Students write three papers in which they deal directly with environmental issues and concerns related to international politics.	<i>Global Environmental Politics</i>, Porter and Brown.
Public Relations Case Studies and Research - PR 371	"The concepts of sustainability and harmonious interaction with the environment are inextricably linked to the basic definition of public relations. I anticipate that nearly every class period I will draw on some environmental example of how organizations interact with and depend on a favorable/healthy environment."		Students are required to seek out resources on the internet such as "Environmental Public relations," an on-line newsletter;
Public Relations Writing – PR 372			<i>Ishmael</i> and <i>The Story of B</i>, Daniel Quinn; <i>Education for Sustainability: An Agenda for Action</i>; <i>Sustainable America: A new Consensus</i>; <i>Building on Consensus: A Progress Report on Sustainable America</i>.
Social Psychology - PSY 250	Reading and writing assignments focus on applications of the course material to environmental concerns. For example, we will discuss: ways to assess attitudes toward environmental issues such as energy	Students write three integrative papers on the following topics: Attitudes and Behavior: Recycling in the Dorms; Social and Cultural Influences on Environmental Attitudes and Behaviors; Social Psychology and Environmental	Readings drawn from : <i>Journal of Environmental Education</i>; <i>International Journal of Environmental Studies</i>; <i>Environment</i>; <i>Journal of Environmental Psychology</i>; <i>Environment and Behavior</i>; EPA

	conservation, Justice. <i>Journal.</i> recycling, and toxic dumping; the relationship between these attitudes and actual behavior; environmental racism; and applications of social psychological principles to decision making in social dilemmas.	
Cardiopulmonary Therapeutics - PT 630	Students will become familiar with health related environmental issues facing the industrial world. "I hope to make students more conscious of their individual and collective responsibilities to live in a safer world, a world in which they may have to organize collective pressure on governments and corporations to observe proper safety/medical standards to insure that the environment is not polluted."	In addition to the clinical work required by this class, students now read six articles covering a wide variety of subjects from health care waste disposal to the hazards faced by uranium miners in the Soviet Union. Too many to list here? Students select from 20 articles on reserve.