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Course-based campus environmental research projects

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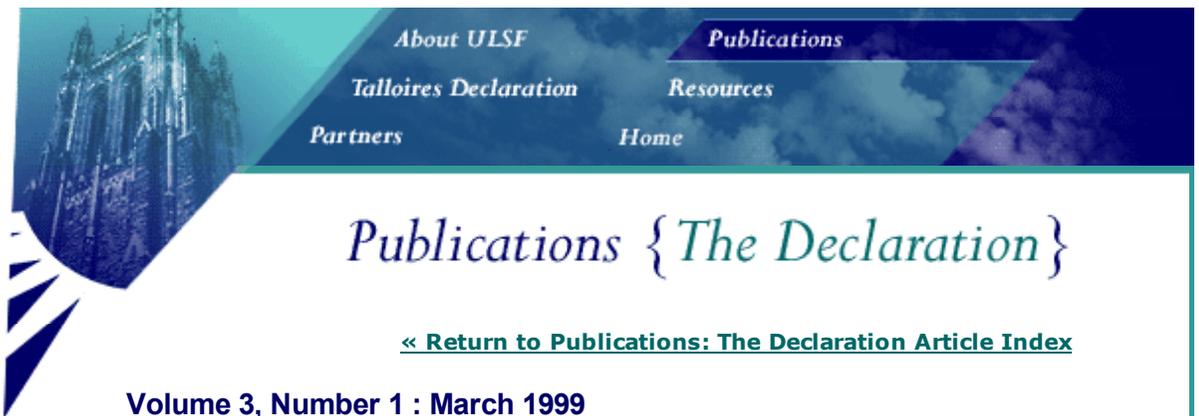
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Research: Course-Based Campus Environmental Research Projects

by *Janice Edgerly-Rooks, Amy Shachter and Wynn Calder*

Campus administrators and faculty across the country are realizing the educational and economic value of "campus greening." Many administrators have established clear environmental campus policies in an effort to recognize the economic value of green institutional operations and to respond to the need for adopting sustainable practices. Faculty and students have contributed to the green movement by integrating the physical campus into the educational process. At many institutions, students have led efforts to implement environmentally friendly, and in some cases, economically sensible practices particularly in the areas of energy conservation and waste management. Faculty and students have worked together on class projects and independent research to contribute to the "greening" movement.

Many institutions have a legacy of environmental consciousness that began in the early 1970s. At Santa Clara University (SCU), in Santa Clara, California, "greening" has occurred more recently with the start of an Environmental Studies program in 1992 and a Campus Environmental Assessment in 1995. A strong driving force for "greening" of the campus has been student and faculty interest manifested primarily as course-based campus projects. This article discusses some outcomes of environmental research conducted by students and faculty in chemistry, biology and anthropology. Some avenues are suggested for enhancing the research experience and for incorporating significant findings into the University's modus operandus.

Research and Learning Outcomes

As a visiting scholar, Al Fritsch, SJ, of Appalachia-Science in the Public Interest, conducted a preliminary Campus Environmental Assessment (CEA) at SCU in Fall 1995. The CEA produced a series of recommendations for future study with particular emphasis on ten areas of special concern including waste management, energy conservation, wildlife resources, land use, water conservation and food services. Campus environmental research related to the CEA has been conducted in several courses including Chemistry 1, a non-science majors environmental chemistry course, and in an Independent Study Research course. Since 1995, specific projects have included:

1. survey of campus bird populations especially focusing on their relationship to specific plants and gardens
2. development of a Native Species Garden and of educational materials describing the natural and cultural history of native Californian plants
3. development of a Community Garden utilizing composting techniques for yard waste and yielding produce for donation to local community centers

4. evaluation of indoor air quality involving testing for pollutants in areas near copy machines or where complaints of poor air quality had originated
5. investigation of the efficacy of solar energy and of options for incorporating passive solar systems in new campus buildings
6. investigation of air quality in campus photography labs and an evaluation of the potential for waste recycling
7. investigation of handling of hazardous materials in the sciences including an evaluation of spill preparedness, radioactive isotope storage, and inventory methods

Chemistry professor Amy Shachter notes that ongoing projects include topics such as electricity deregulation and SCU. A group of students explored electricity use by the campus and investigated the source of campus power. It turned out that the University's present electricity provider supplies a proportion of power generated by wind, a renewable energy source. SCU will have a choice in the next year to change power providers. Thus further study of the economics of changing providers, as well as the ethics of choosing or not choosing more "green power" is needed.

Another project involves reclaimed water at SCU. Since water scarcity is of great concern in California, the use of reclaimed water from the local sewage treatment facility for watering lawns and landscaping will be implemented on campus in the next year. A student group is determining the chemical attributes of reclaimed water and the problems associated with using such water on landscape plants.

Anthropologists have been key players in on-campus environmental research as well. When anthropology professor Russell Skowronek came to SCU in 1991 he developed an intense interest in bringing the University's history as a former Franciscan mission site to his teaching and research. Dr. Skowronek used the mission as the basis for learning about how cultures interact with one another and change the natural environment. With the original mission came domesticated animals, the ensuing destruction of native vegetation, new plants brought by immigrants, and the burning of trees for energy to make tile and brick for the buildings. The effects of these activities on the environment over time, says Skowronek, were "utterly devastating. Mission Santa Clara was ground zero for Silicon Valley," he adds. "It laid the groundwork for what happened two centuries later."

A lasting outcome of Skowronek's work in this area is the Research Manuscript Series on the Cultural and Natural History of Santa Clara - the result of student, professor and independent scholarly research. He has edited nine volumes since 1994, most of which have focused on the cultural ecology of the region, including topics such as the oak woodlands, the riparian zone, medicinal plants and how different cultures have viewed their environment. Students have worked with original documents from the mission as well as collections housed in the SCU Archaeology Research Lab. Intersecting with work in chemistry and biology, Dr. Skowronek has supported including signage in the Native Plant Garden that describes indigenous peoples' interactions with plants and animals.

Beyond the Campus

Students in environmental studies also have opportunities to expand their research experience at sites remote from campus. In 1998, twelve natural and social science students learned basic interdisciplinary, environmental research skills in a quarter-long seminar course during the academic year and then participated in a summer research program in Trinidad and Tobago. Biology professor Janice Edgerly-Rooks and anthropology/sociology professor Margaret Graham coordinated the research methods course and summer research program.

While in a fishing village in Tobago, students assessed local villagers' environmental

knowledge to help the local non-profit organization, Environment Tobago, develop an environmental education program. On neighboring Little Tobago, four biology students tested methods for surveying biodiversity; these methods will become part of a larger project as Environment Tobago seeks to census biodiversity on the entire island of Tobago. Research was also conducted in Trinidad, where students performed a bird and ethnobotany survey at a site soon to be developed for ecotourists. The anthropology students, in the meantime, addressed social concerns facing members of the rainforest community as they confront the new industry of tourism. The student work was so impressive that local officials on Tobago are hoping to give it broader public circulation and a professor at the University of West Indies at St. Augustine has shown an interest in publishing the student bird census paper.

The Trinidad and Tobago research program has become a paradigm of environmental studies and community outreach. In the near future, students will help the Trinidadian non-profit environmental group, Paria Springs Trust, establish a model of permaculture and sustainable development in the rainforest. SCU's International Programs and Environmental Studies Program sponsored the Trinidad and Tobago program.

Outcomes: Quantitative and Qualitative

Through their research experience, students gain some level of mastery regarding specific content and learn basic methods. They review previous work on campus, obtain information on similar issues at other campuses, gather information through interviews and available documents, and analyze and interpret results. For group projects, leadership and group dynamics skills begin to emerge. Furthermore, students must learn how to present results in various types of written reports and in poster presentations.

Although many projects begin as scientific research, due to the complexity of environmental issues, students learn that ethical, social, and economic relationships are often key to the success of their project. Students doing research on campus must develop relationships with staff and administrators to obtain information and gain an understanding of how the university operates. In establishing those connections, students learn the complexities of operations and develop sensitivity to the roles staff and administrators play in defining daily campus functions. Finally, students gain a sense of ownership and a connectedness to the campus. Participating in campus-based projects forces students to realize that they are stakeholders, along with the faculty and staff, in the "greening of the campus." Ultimately, it is hoped that students recognize they are environmental stakeholders in any place they choose to live.

Enhancing Research Experience

Faculty can use the environmental studies curriculum (multidisciplinary by its nature) as a template for developing a program of instruction for conducting research. Clearly,

guidance from colleagues in diverse fields is required for faculty to become more effective mentors for the environmental studies students. Workshops focused on the ethical dimensions of multidisciplinary research, such as those offered by SCU's Markkula Center of Applied Ethics, can be helpful. In these workshops, students and faculty address questions concerning interpersonal relationships before and concurrent with their research.

Students can also benefit from guidance about the various ways of gathering information from staff members without appearing as "rabid environmentalists." Serious, open-minded and fair environmental fact-finding can be rewarding for the interviewer (the student) and interviewee if mutual respect can be established at the outset of the interaction. The risk of bias when collecting and interpreting data is also a lesson easily revealed if students make errors of interpretation because of bias for

Lesson easily revealed if students make errors of interpretation because of bias for environmental, or against economic, concerns. Faculty and students alike need to be wary of biases that creep in because of their pro-environmental attitudes. Maintaining lines of communication with faculty from diverse fields on campus can help one stay aware of these potential problems.

Implementing Change

Disseminating the results and recommendations of course-based projects is as important as conducting the research. Implementing a set of recommendations for "greening the campus" has proven to be one of the more difficult and most rewarding aspects of conducting environmental research. An initial step towards implementation is sharing the results with the University community. Several avenues for publicly presenting research results have been adopted at SCU: campus-wide symposia and poster sessions, and student-authored articles for an environmental newsletter and the student newspaper.

Direct contact with administrators through the symposia and poster sessions can lead to policy changes. More often, a greater effort - beyond the time limits imposed by the quarter or semester system - is necessary to implement "greening." A student-controlled mechanism is to work within the Santa Clara Community Action Program (SCCAP) which, for example, has helped secure the Community Garden. Another powerful mechanism is the recently formed University Environmental Coordinating Committee. This committee is composed of faculty, staff and students and is designed to shepherd the recommendations of environmental projects through university channels.

Conclusion

Course-based environmental research projects are a template for a multidisciplinary environmental studies program. Research students learn basic research methods and develop problem-solving skills necessary for investigating and solving multifaceted, environmental problems. Students also gain leadership skills, learn to recognize and evaluate ethical dilemmas and different points of view, and promote informed environmental action. Faculty are also empowered, as multidisciplinary support grows, to design and conduct further environmental research and urge their colleagues, both faculty and administrative, to push for campus action and institutionalization of positive environmental practices. Furthermore, connecting campus-based courses and research efforts beyond the campus serves as an excellent means of supporting and fostering community action.

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