Report to
The California State University,
Office of the Chancellor
Campus as a Living Lab Grant Program

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Development of an Introduction to Environmental Science Course
Incorporating the Campus as a Living Laboratory

Purpose: The purpose of this project was to deliver a general education course entitled Introduction to Environmental Science to be offered each Fall beginning in 2014. The course’s primary focus is to introduce SF State undergraduate students to the field of environmental science, incorporating many of the disciplines within the College of Science and Engineering at SFSU. The course emphasis is on sustainability, incorporating the SFSU Campus as a Living Lab and increasing student learning on the ways they impact the environment both positively and negatively. Using funding provided the course was designed as a lecture and laboratory using the SFSU campus as the core site for most lab exercises. Using this grant lab exercises and assignments were designed to engage students in practical issues of sustainability as they relate to their local environment through scientific discovery and service learning activities.

The course proposal for an Introduction to Environmental Science course was submitted and approved in Spring 2013. During Spring 2014 it was approved for the lower division General Education Area B: Life Science and Lab Science requirements as well as SFSU’s General Education Sustainability Overlay requirement. Until this course, an introductory, lower division course in environmental science did not exist on the SFSU campus. This course will be articulated with community colleges and allow transfer students who have taken such a course at the community college level, or students with AP Environmental Science credit, to articulate this course into their SFSU transcript.

The learning outcomes of the course are:
1) Understanding the basic concepts in the scientific method of inquiry;
2) Understanding and analyzing ecological and environmental systems and processes;
3) Critically evaluating the interactions between earth processes and human population at the global, national and local scales;
4) Examining and evaluating local ecosystems and their interactions with local human systems by assessing sustainability on the campus (such as air and water quality, waste streams, ecological systems, biodiversity and energy use)
5) Participating in campus and community actions to improve the environment. The course will be assessed through examinations and assignments students are required to complete, as well as student reflections, and self-evaluations.

The course is now part of the Department of Geography & Environment’s annual general education offerings as well as a required course in a newly proposed major in Environmental Science and a lower division elective course in the Geography major.

Methodology: The Introduction to Environmental Science course was also designed to include high impact practices such as small labs where students had an opportunity to work together on collaborative assignments and projects involving researching, gathering and analyzing campus data.

The course was designed to include laboratory exercises and assignments that address specific sustainability issues on campus, require students to engage in scientific research, and engage in the campus and
community. In the course, basic ecological and environmental concepts and processes were explained, and the impacts of these phenomena on living organisms including humans were discussed. Possible solutions and strategies to improve the environmental state of the world were examined. The designed labs incorporated the SFSU campus as a living laboratory for sustainability and environmental study and allowed students to apply the concepts from lectures in the field. In the labs students received practical experience in applying what they have learned in lecture to the local environment with an emphasis on the SFSU campus and sustainability. The labs created using the SFSU campus as the study site included labs on biodiversity, air quality and water processes. 

With the assistance of one graduate student I developed six specific laboratory/campus exercises, with the cooperation of staff in the Offices of Physical Planning and Development (Capital Planning, Facilities and Sustainability Departments). Volunteering opportunities enhanced students’ level of campus engagement and their connections to each other, building a community of engaged environmental learners.

**Results:**
Small learning communities structured as labs allowed students to get to know each other and their campus environment. In labs students worked individually and in small groups of 4-5 with a TA or Instructor leading the groups. The course used the assistance of 3 upper-division Environmental Studies and Geography students as mentors who assisted students with their lab assignments, class and group discussions and studying for exams,

During the 2013-14 academic year with the funding granted through this program, a set of 6 labs were created for the course. The labs developed include the following:

**Campus Biodiversity and Habitat Use:** These labs investigated the ecological systems on campus and how campus landscapes influence the wildlife and pollinators in the area. The lab incorporated an assessment of several of the habitat gardens on campus including the Landscape Learning Laboratory Botanical Garden, the Health Center Bee Garden and Pollinators Perimeter Garden. Students assessed the biodiversity of plants and pollinators in these gardens and compared it to areas that were mostly lawn. The hope is to each year record the data on plant diversity and health and pollinator population into an ongoing database to assess the success of these gardens in increasing local biodiversity on campus. Through these activities students learned about native ecosystems, environmental interactions, and techniques involved in ecological assessment. Students in the photos below (Figure 1) are engaged in these biodiversity labs on the SFSU campus.
Figure 1: Students assessing SFSU campus biodiversity.
Campus air quality: In these labs students investigated air quality at various locations around campus with an emphasis on particulate matter. With the assistance of Global Community Monitoring Organization (a local nonprofit environmental justice organization), air monitoring equipment was set up at the front and back of campus and particulate matter 2.5 was measured. Students also assessed daily sources of particulate matter around these site. Monitoring data are currently being analyzed and results will be submitted to the Physical Plant on completion of this study. Securing locations for the monitors were problematic due to safety and security concerns. Monitors were not placed in ideal locations, results are not anticipated to be significant. If this is to become an ongoing effort we would want to secure permission from campus facilities for permanent placement of monitors in locations that would yield better data.

Figure 2: Students evaluating sources of particulate matter on the SFSU campus.
Campus water quality: In these labs students investigated water systems on campus by evaluating water management demonstration projects. Students performed evaluations of where water tended to pool on campus and infiltration rates of water into the soil at various locations. From this assessment students could evaluate the recent low impact development (LID) storm water management demonstration projects on campus and suggest new locations for future sites (Figure 3).
Students volunteering/Community service
Campus and community service learning opportunities where students worked with campus staff and community environmental groups to help solve local environmental issues were incorporated into the class. Students worked on campus planting trees with the Physical Plant and EcoStudent group, as well as in the larger SF community with the Golden Gate National Park Service, Friends of the Urban Forest, and California Coastal Commission, among others. Each student completed 5 hours of community service during the semester.

Partnerships: On Campus collaborations with the Campus Office of Physical Planning and Development, Campus Sustainability Office, were very helpful in helping us locate sites for the air quality monitors.
Global Community Monitor, a non-profit community based environmental justice organization assisted in getting the monitors and training myself and my assistance in its use and analysis.

Although this semester I was unable to incorporate lectures from faculty in other science disciplines doing research in environmentally related fields such as Geosciences, Chemistry, Engineering and Biology in this course I hope to do so in the Fall of 2015.

C. Budget: The budget included one course release time for the professor designing the course ($4971) during Spring 2014; one graduate student assistant time at 10 hours a week for 15 weeks ($1800) to assist with research, facilitation and designing labs. The budget also included three small undergraduate student stipends ($600) for undergraduates participating in trial runs on laboratory exercises and assignments and funding ($3675) to rent air quality monitoring equipment from Global Community Monitor for the first semester of the course until more permanent equipment can be acquired.

Summary and Conclusion: The new general education course entitled Introduction to Environmental Science using the “Campus as a Living Lab” was delivered in Fall 2014. Sixty students (the maximum allowed) were registered for the class and 58 completed the course. Student volunteered on campus in planting trees and working on sustainability issues and volunteered outside the campus in community environmental ventures. The course provided students with a basic education in environmental processes and the labs provided students with hands on opportunities for environmental investigations while supplying information to improve sustainability efforts on SFSU campus. The course has been articulated with community college courses. Overall the initial offering of the class was successful. Updates and modifications with the labs will be underway Spring 2015. We discontinued the air monitoring when rental funds were expended. Further funding for permanent air and water quality monitoring equipment will be investigated.