

Campus as Living Lab Project Final Report:
Linking South San Francisco Bay Campus as Living Labs in a Learning Community

Lynne Trulio, Chair of the Department of Environmental Studies and Chair of the Sustainability Board, San José State University

Kristin Jensen Sullivan, Chair of the Environmental Studies Department, De Anza College

David Sauter, Director of Environmental Horticulture & Design Program, Foothill College

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Background

The CSU Chancellor's Office funded San José State University to develop a Campus as a Living Lab (CLL) program in 2013-2014. We developed a learning community to advance sustainability curriculum at three campuses--San José State University (SJSU), De Anza College and Foothill College. As a result of our program, a diversity of faculty at the three campuses are using campus sustainability features in their courses. We achieved these objectives of the program: 1) developed maps/lists of sustainability features at each campus, 2) produced teaching modules for nine sustainability features that any instructor can access for their courses, and 3) developed a learning community of instructors from the three campuses who are using Campus as Living Lab features in their classes to link sustainability and course principles. Thanks to this work, we are infusing sustainability more widely through our respective curricula. Students taking courses in a wide range of disciplines will learn sustainability principles and will explore aspects of their campus--and other local campuses--that promote sustainability.

The program coordinators for the project were Lynne Trulio, Chair of the Department of Environmental Studies at San José State University, Kristin Jensen-Sullivan, Chair of the Environmental Studies Department at De Anza College and David Sauter, Director of the Environmental Horticulture & Design Program at Foothill College. Lynne coordinated the overall project, organized meetings and the workshop, advertised the program on her campus and ensured materials were posted on the web. Module writers for SJSU were Gina Bacigalupi and Peggy Cabrera. Kristin coordinated the work from De Anza, directed the development of the modules for De Anza and she developed and taught the course (ES 93) that brought faculty to the project; module writers for De Anza were Lisa Templeton and Elizabeth Flores-Lathan. David directed the work at Foothill College, wrote a module, and advertised the project on his campus. In addition to David, Foothill College module writers were Lisa Schultheis and Gillian Schultz.

In our original proposal, we listed specific outcomes we would achieve in this program, as shown in Table 1. In this report, we describe how we met these outcomes. Most of the materials developed for the program are in Appendices to this report and others are found online at <https://sites.google.com/a/sjsu.edu/participants--campus-as-living-lab/>. The expense report for the project follows this narrative; it shows we spent \$11,857.00, just under the \$12,000.00 allotted for the program.

We thank the CSU Chancellor's Office for providing the opportunity for this exciting and uplifting collaborative experience.

Table 1. Outcomes and Assessment Methods for the SJSU/De Anza/Foothill CLL Project

Outcome	Assessment Method
1) Map sustainability features at each campus to be used as living lab features in a variety of courses on each campus	Digital maps with sustainability features for each campus, vetted by appropriate campus groups, and available to all
2) Educational materials for at least 3 campus features per campus	Teaching modules in usable form for instructors; vetted by instructors in the learning community
3) Learning Community Workshop and Field Trips	30 faculty, 10 from each campus, will participate in a Learning Community Workshop and Field Trips to each campus
4) Campus as living lab features incorporated into courses	All 30 faculty in the learning community will provide a greensheet showing how at least one living lab feature is incorporated into a course
5) Evaluation of modules at the workshop	Participating faculty will comment on how to improve the teaching modules and evaluate Learning Community program
6) Inform others on each campus about this program	Meetings with deans, administrators, and sustainability groups on campus
7) Make Campus as Living Lab materials available to all instructors	Each campus posts all program materials on their campus website for anyone to use
8) Promote institutionalizing the program	Provide key entities on each campus with information on updating maps, conducting future workshops and promoting the use of living lab campus features in courses

Results

Outcome 1: Map sustainability features at each campus to be used as living lab features in a variety of courses on each campus

To begin our project, Lynne, Kristin and David worked with their campuses to find or develop a map of campus sustainability features. We felt this would be an ideal way to determine the features available on each campus that could be the focus of teaching modules. SJSU already had a map, which was developed by the SJSU Sustainability Board. This interactive map is found online at <http://www.sjsu.edu/sustainability/sustainablecampus/sustainabilitymap/index.html>. De Anza College had a partial map (<http://www.deanza.edu/vtour/map/>). Foothill College did not have a map. However, having one created was hindered by bureaucratic issues. Since our primary goal for this project was to develop teaching materials and a learning community, we developed lists of sustainability features at De Anza and Foothill Colleges from which to choose as the focus for teaching modules, rather than expend additional energy on maps. This approach worked very well as David and Kristin were extremely knowledgeable about the sustainability features on their campuses.

Outcome 2: Educational materials for at least three (3) campus features per campus

Educators from each of the three campuses developed teaching modules for a total of nine sustainability features, three from each campus. While each module was unique, they all had a suite of elements in common, as given in Appendix 1. These modules are designed to be "plugged into" courses and to provide the background and materials an instructor would need to use them. Each module gives students a hands-on, out-of-classroom experience in sustainability. We developed modules for these campus features:

De Anza College

- Kirsch Center, the LEED-certified Environmental Studies building
- Campus Food System, promoting a healthy planet and healthy lives
- Cheeseman Ecological Area, a campus botanical area illustrating the natural biodiversity of our region

Foothill College

- Composting Site, illustrating the process of composting waste
- Phenology Lab, exploring plant responses to climate change using web and campus sites
- Waterwise Plant Lab, exploring adaptations to dry climates using plants on campus

San Jose State University

- Sustainable Agriculture Garden, an organic teaching garden on campus
- Martin Luther King, Jr. Library, a LEED building shared with the City of San Jose
- Cogeneration Plant, SJSU's efficient energy generation and heating/cooling system

Summaries of each module are given in Appendix 2 and each complete module can be seen at <https://sites.google.com/a/sjsu.edu/participants--campus-as-living-lab/>. By the end of August, all modules will be posted on the Sustainability@SJSU webpage (<http://www.sjsu.edu/sustainability/>), a public site, for anyone to use.

Curriculum experts from each campus developed these modules between September 2013 and April 2014. We met each month to discuss the curriculum and issues that arose as we worked on the project. We showed each other module sections as we went along and, through this iterative process, developed unique teaching materials that addressed key sustainability concepts.

These modules were the bulk of the work for this project and represent a tremendous effort on the part of the project coordinators and module writers. We hope to continue to refine these in the future and add new modules. We also hope to inspire other instructors to write modules of their own focused on getting students out of the classroom and experiencing hands-on sustainability learning.

Outcome 3: Learning Community Workshop and Field Trips

While developing the modules, we were also seeking instructors from all three campuses to participate in a workshop designed to teach the instructors how to use the modules in their courses. Twenty-three instructors enrolled in the workshop, representing all three campuses and a wide range of disciplines (Table 2). This group along with the campus program coordinators formed a vibrant and enthusiastic learning community. We held the workshop on April 25, 2014, from 10:00am-3:00pm on the SJSU campus, which included a field trip to the features for the three SJSU modules (workshop agenda in Appendix 3). Before the workshop, participants had access to a website that had a description of the project, summaries of each module and each of the nine modules. A second field trip, to the De Anza and Foothill College sites, was held approximately two weeks after the Workshop.

Table 2. Summary of instructors participating in the Learning Community

<i>Campus & Number Participating from that Campus</i>	<i>Departments Represented</i>	<i>Courses Targeted to include CLL Modules in AY 2014-15</i>
De Anza = 9	English, Speech Communication, Humanities, Economics, Biology	EWRT 1A-Writing and Research SPCH 1-Public Speaking HUMI 9-Comparative Religions ECON 2-Microeconomics BIOL 6B/40B/40C-General Biology courses
Foothill = 7	English, Horticulture, Chemistry, Biology, Engineering	ENGL 1A-English Composition and Writing HORT 10-Environ. Horticulture & Urban Landscape CHEM 1C-General Chemistry BIOL 10-General Biology BIOL 1C-Evolution, Systematics, Ecology ENGR 40-Introduction to Clean Energy Technology
SJSU = 7	Communication Studies, Sociology, Art & Art History, Child & Adolescent Development, Biology, Geology	COMM 20-Public Speaking ARTH 72-Design in Society SOCS 120-Environmental Sociology CHAD 60-Child Development SCI 110-Global Themes of Science BIOL 10-The Living World BIOL 145/255-Ecology & Climate Change GEOL 103-Earth Systems & Environment

Outcome 4: Campus as living lab features incorporated into courses

Workshop participants incorporated CLL modules into one or more courses to be taught sometime in 2014/15. Courses include a wide range of subjects including design, english, chemistry, economics and biology courses. Table 2 gives the list of courses incorporating modules. The greensheets for these courses will all be located on the Sustainability@SJSU website by the end of August 2014. Lynne will email each instructor in August and December 2014 to find out who will be using modules and to ensure those instructors are connected to a contact who can help them with the module and/or access the physical campus site.

Outcome 5: Evaluation of modules

At the end of the CLL Workshop, Lynne collected forms with instructor evaluations of the modules (see Appendix 4 for the form). We are using these comments to revise the modules and to guide follow-up activities to support module use. Some especially useful comments were to:

- Provide links to local relevant groups/resources
- Give ideas for how to mix and match modules
- Recommend ways to use parts of modules
- Give detailed campus visit protocols
- Set up a web chat group for instructors to stay in touch with each other
- Develop a module on "sustainability"

In particular, this fall we are hoping to develop a new module on the topic of "sustainability", which will be of great assistance to instructors. We are also working to have a web chat site that instructors can use to stay in contact with each other and to discuss modules.

During the AY 2014-2015, Peggy has committed to interviewing as many instructors as possible to conduct a post-module use assessment. We will use this assessment to improve modules, provide support to instructors, and identify ways to further institutionalize the use and expansion of CLL modules. This follow-up assessment will provide another valuable evaluation of the modules.

Outcome 6: Inform others on each campus about this program

During the Fall 2014 and Spring 2015, each CLL campus coordinator meet with faculty, department heads, and administrators to advertise the project. For example, at SJSU, Lynne meet with the Council of Chairs and Council of Deans to advertise the project and Sustainability Board members sent CLL announcements to chairs and faculty in their colleges. This effort resulted in an excellent group of faculty participating in the workshop.

The CLL coordinators all agree that it is essential to continue to get the word out on our campuses about the availability of the modules for any instructor to use. Ways we will achieve this include:

1. Having all CLL materials posted on the Sustainability@SJSU website.
2. Having links at all three campuses to the SJSU website.
3. Having the SJSU Sustainability Board members publicize the modules to their colleges through college chairs' meetings, to the Deans, Associate Deans and using vehicles such as the Center for Faculty Development to advertise the modules.
4. Advertising to faculty at Foothill College through their sustainability forum.
5. Offering a class, ES 93: Sustainability across the Curriculum, at De Anza College for faculty for all three campuses to take that will include using the CLL modules.

Outcome 7: Make Campus as Living Lab materials available to all instructors

All materials are available to CLL Workshop participants at <https://sites.google.com/a/sjsu.edu/participants--campus-as-living-lab/>. The Sustainability@SJSU website will be the public repository for all CLL materials. The site will be active and available to any one by the end of August, 2014. The site will have all

materials on the project, as well as all modules, greensheets of the 2014 workshop participants, and a place for module users and those interested in using the modules to leave comments and even provide new materials for others to use. Lynne will monitor and maintain the site in AY 2014-2015. After that, the SJSU Sustainability Board will determine how best to maintain the site.

Outcome 8: Promote institutionalizing the program

The CLL project coordinators agreed that this was a truly wonderful project and we want to perpetuate it. In June 2014, the coordinators met and agreed on these actions to undertake in 2014-2015:

1. David, Lynne, Peggy and Kristin will be the self-appointed caretakers of the modules and their continued use; we expect to meet at least once a semester in AY 2014-15.
2. Lynne will contact all CLL workshop participants in early August to find out who is using a module in the Fall and which modules they are using. She will connect the module users with the contact for that module.
3. In Fall, Peggy will follow up with module users to do an assessment on use of the modules.
4. We expect to develop another module on "Sustainability".
5. To help institutionalize the use of modules, De Anza will offer the course ES 93, Sustainability Across the Curriculum, next Spring for instructors at De Anza, Foothill and SJSU--and we will have a joint workshop in Spring 2015, following basically the same workshop format as Spring 2014.

Key strategies for institutionalizing the project include:

1. Having materials hosted for the foreseeable future on the Sustainability@SJSU website.
2. Having site where instructors can add to and comment on existing modules or even add new one modules to the module library on the SJSU website.
3. Each semester, having SJSU Sustainability Board members advertise the modules to their respect units on campus.
4. Encouraging faculty to write new modules or materials to go with existing modules.
5. Offering ES 093: Sustainability Across the Curriculum, each Spring for faculty from all three campuses and holding a workshop in the Spring to instruct faculty in using the modules.
6. Seeking additional funding to build on this project. In particular, we would like to join with more campus to develop additional modules.

Project Expense Report

Expenses for Campus as Living Lab Program - San Jose State University

NAME	Description	Cost
SCHULTHEIS, LISA	Module writer, workshop participant	\$700.00
CLINCHARD, LORI	Workshop participant	\$200.00
FLORES-LATHAN, ELIZABETH	Module writer	\$1,250.00
TEMPLETON, LISA	Module writer	\$250.00
CORMIA, ROBERT T	Workshop participant	\$200.00
SCHULTZ, GILLIAN	Module writer, workshop participant	\$700.00
BACIGALUPI, GINA	Module writer	\$1,000.00
TRULIO, LYNNE	Project Coordinator	\$500.00
KAUR, SHAGUNDEEP	Workshop participant	\$200.00
GAINER, BRANDON	Workshop participant	\$200.00
TAKAMOTO, KACY	Workshop participant	\$200.00
SMITH, LEONARD	Workshop participant, video services	\$500.00
THOMAS, MONICA	Workshop participant	\$200.00
SULLIVAN, KRISTIN J.	Project Coordinator	\$700.00
SLUSSER, EMILY	Workshop participant	\$200.00
CNUDDE, ROXANNE	Workshop participant	\$200.00
CAPARAS, FRANCESCA	Workshop participant	\$200.00
CONSAVARI, ELIZABETH C	Workshop participant	\$200.00
GIARDINO, ALEXANDRIA	Workshop participant	\$200.00
CABRERA, PEGGY	Module writer, project evaluation	\$1,000.00
KANG'A, SIMON	Workshop participant	\$200.00
WESOLOSKI, LISA	Workshop participant	\$200.00
TRULIO, LYNNE	Workshop development, web work	\$500.00
JACOBS, REBECCA	Workshop participant	\$200.00
SAUTER, DAVID	Project Coordinator, module writer	\$750.00
TERUYA, LE ANNE	Workshop participant	\$200.00
MACKIE, JOSHUA	Workshop participant	\$200.00
THIELE, MEGAN	Workshop participant	\$200.00
"Just Below" Catering	Workshop coffee/tea	\$85.00
"Pomegranate Café" Catering	Workshop lunch	\$522.00
TOTAL		\$11,857.00

Appendix 1: Module Elements (2 pages)

Basic Information for Teaching Module Development

Notes on Modules:

- * Each module should be designed to occupy one class period of approximately 1 hour 15 min.
- * Specify all materials an instructor will need.
- * For each site, specify who the instructor needs to contact to visit the site, what amount of lead time is needed, and any other important information about the site.
- * For each module, assessment tools for specific GE learning objectives, so that instructors can easily use the module to assess particular SLOs.
- * When appropriate, specify videos, reading material and terms students need to know.

Basic Contents of Each Module:

- * General sustainability definition and principles
- * Specific sustainability principles that apply to this feature
- * Discussion of the feature and its sustainability elements
- * Connecting the feature's elements to specific GE course principles
- * Discussion of how this feature helps promote a sustainable society
- * Description of a hands-on component or activity for students

GE Linking:

As an example of how to link GE areas to a module, for the SJSU Sustainable Agriculture Module, here are some GE Areas Lynne thought were relevant:

GE B2: Students should be able to:

1. use the methods of science and knowledge derived from current scientific inquiry in life or physical science to question existing explanations;
2. demonstrate ways in which science influences and is influenced by complex societies, including political and moral issues; and
3. recognize methods of science, in which quantitative, analytical reasoning techniques are used.

Life Science (B2) courses focus on:

- a. structures and functions of living organisms;
- b. levels of organization of living systems, from atom to planet;
- c. strategies for survival and reproduction;
- d. patterns of evolution;
- e. principles of genetics, including the basis for variation; and
- f. interaction of organisms and their natural environment.

GE B4: The mathematical concepts course should prepare the student to:

1. use mathematical methods to solve quantitative problems, including those presented in verbal form;

2. use mathematics to solve real life problems; and
3. arrive at conclusions based on numerical and graphical data.

GE D1, D2, D3: Students will be able to:

1. place contemporary developments in cultural, historical, environmental, and spatial contexts;
2. identify the dynamics of ethnic, cultural, gender/sexual, age-based, class, regional, national, transnational, and global identities and the similarities, differences, linkages, and interactions between them; and
3. evaluate social science information, draw on different points of view, and formulate applications appropriate to contemporary social issues.
 - Human Behavior (D1) students will be able to recognize the interaction of social institutions, culture, and environment with the behavior of individuals.
 - Comparative Systems, Cultures and Environments (D2) students will be able to compare and contrast two or more ethnic groups, cultures, regions, nations, or social systems.
 - Social Issues (D3) students will be able to apply multidisciplinary material to a topic relevant to policy and social action at the local, national, and/or international levels.

SJSU Area R: Within the particular scientific content of the course, a student should be able to:

1. demonstrate an understanding of the methods and limits of scientific investigation;
2. distinguish science from pseudo-science; and
3. apply a scientific approach to answer questions about the earth and environment.

Appendix 2: Summaries of the Nine Teaching Modules (9 pages)

DeAnza Module 1 Summary: Food, Environmental Justice, and Integrated Waste Management

Tour the De Anza Dining Services to learn about food systems, environmental justice, and integrated waste management. Additionally, tour the food garden at the Kirsch Center for Environmental Studies (KCES).

Students will learn about sustainability as it relates to food, environmental justice, and integrated waste management. For example, environmental justice issues including access and affordability to healthy food choices will be explored. After a brief introduction, students will visit the campus Dining Services at De Anza. Students will analyze where the food is sourced from and the health properties of available meals. Additionally, students will look at the waste management program including packaging, disposable items, signage, and methods of disposal.

Next, students will visit the food garden at the Kirsch Center for Environmental Studies on campus to learn about how food is grown. Sustainable farming practices and healthy food choices will be explored and discussed. Students will complete questions about what makes for a sustainable food system. Critical thinking will be utilized to brainstorm more about food, environmental justice, and sustainable integrated waste management.

Key Concepts:

- Sustainable multiple-use management of food resources, following food from production to consumption (i.e. resource use, zero waste vs. disposal).
- Environmental impacts of food production and how production methods affect the nutritional content of food.
- Improvement of public health through environmental justice, good nutrition and healthy food options.
- Pollution prevention through integrated waste management practices, such as rejection, source reduction, reuse opportunities, and recycling methods.

DeAnza Module 2 Summary: Green Building, Design, and Environmental Health and Justice

Visit the LEED-certified Kirsch Center for Environmental Studies (KCES) to learn more about green building design, environmental health and justice, and working toward mitigating climate change through sustainable design in all of our institutions.

Take students on a tour of the Kirsch Center for Environmental Studies (KCES), a LEED certified building designed by Eco-Architect, Dave Deppen. Students will begin by learning the elements of green building such as passive solar design, sustainable building materials, and landscape design. Students will also participate in a hands-on activity that uses our latitudinal position, the 37th parallel, as a basis for tracking various paths of the sun throughout the year and for learning how green buildings are designed according to particular climates. Students will then investigate and communicate the relationships between environmental health and justice, climate change mitigation, and sustainability through applying the elements and principles of green building design.

Key Concepts:

- How elements of green building apply to sustainable, environmentally healthy, equitable, and just societies
- How green buildings utilize nature to reduce energy consumption and mitigate climate change
- Passive solar design
- Students will assess model green building policy and guidelines including LEED™ (Leadership in Energy and Environmental Design)
- Students will identify and understand the value of green building to society and to the individual

DeAnza Module 3 Summary: Native Plant Communities and Environmental Protection for All

Take a field trip to the Cheeseman Environmental Study Area (ESA), a 1.5 acre urban oasis located adjacent to the KCES on the De Anza College campus. Learn about the importance of protecting natural spaces for people and all living beings. All people deserve access to natural spaces for physical, emotional, mental, and spiritual health.

Take a field trip to the Cheeseman Environmental Study Area (ESA), located adjacent to the KCES on the De Anza College campus. The Cheeseman ESA is a 1.5 acre urban oasis, home to approximately 500 species of native plants representing 12 California native plant communities. Students will study sustainability as it relates to the biological significance of the California Floristic Province (CFP). Students will identify and assess the dominant components within native plant communities in the California Floristic Province. Additionally, students will learn about the environmental parameters that affect the presence of these communities. Students will also learn about the importance of environmental justice as it relates to protecting natural spaces for people and all living beings. All people deserve access to natural spaces for physical, emotional, mental, and spiritual health.

Key Concepts:

- Assess native plant communities, ecosystem diversity and biological significance of the California Floristic Province (CFP). For example, what is a biodiversity hotspot and how many plant species are vulnerable, threatened, endangered, etc.
- Appraise the relationship of topography and species distribution and the role that these relationships play in species endemism in the CFP
- The importance of protecting natural spaces for climate change mitigation
- Introduction to invasive species and their effects on native plant associations
- Environmental justice and the fact that all people, regardless of race or socioeconomic status, deserve access to natural spaces for physical, emotional, mental & spiritual health

FOOTHILL COLLEGE Module 1 Summary: HOME COMPOSTING MODULE

Students will learn the connection between soil health and plant health, and the resulting benefits of maintaining soil health for growing plants that produce food, cleanse the atmosphere, and provide a more beneficial and rewarding environment. A healthy soil can also store, rather than repel water and will reduce erosion. Soils of any conditions, poor or healthy, can benefit from the application of compost as a regular amendment, and understanding those relationships and the methods for compost production on a home level will improve overall community sustainability. This feature is a working example of an action that is ecologically sound, economically feasible, and socially responsible. It is a process that can be maintained without any compromise of the future, and, in fact, address a key issue in helping address the disposal of residential waste without overwhelming landfills and waste disposal facilities. The Compost Demonstration Area at Foothill College Horticulture facility provides students with an opportunity to observe and participate in one of the most viable methods for creating soil amendments for the typical homeowner. Soil science has proven the benefits of regular addition of soil amendments, particularly compost, to soil that is challenged in supporting plant growth. By understanding how compost is created and how it can be added to the home garden, lawn, planting beds, and orchard as a soil amendment, the student will discover the benefits of creating a healthier soil. Students will receive instruction in the benefits and methods of composting in a home setting. Scientific presentations will include the process of component degradation, conditions necessary for adequate decomposition, and activities that increase and/or support the process of decomposition. Lab related activities will include measuring and performing maintenance on an active compost pile, creating a new compost pile, or measurements of compost and native soil samples to allow the students to compare and contrast the differences between native soil and the soil amendment created through the composting process. Students will be expected to know how the different methods for creating compost and the process for creating and maintaining a compost pile.

Activities prepared for the instructor include lecture material on home composting, lab activities at three levels, beginning (measurement of temperature and soil moisture), intermediate (maintenance and creation of a compost pile) and advanced (using soil test kits to measure the humus/organic matter levels of compost and a native soil). Support for the activity includes contact individuals for gaining access to the facility and lab supplies, expected outcomes for the activity, a grading rubric, and reference materials. A section on preparing for the module will help prepare you for teaching the subject regardless of your experience with the composting process.

FOOTHILL COLLEGE Module 2 Summary: PHENOLOGY MODULE

This module will help students to learn about and observe ecological processes in non-destructive research activities. The module will also help students/observers to relate their observations to differences at other sites regionally and nationally. Using protocols created by the National Phenology Network (USA-NPN) and/or Project BudBurst, students will engage in monitoring of phenological (for example: timing of fruiting, flowering, leaf break, nesting, dispersal behaviors) processes of plants on Foothill Campus to investigate the effects of climate change. Their data will be submitted to a national database to contribute to the scientific understanding of climate change effects on animals and plants. There is the potential to create a phenology trail which would be an interpretive walk through natural parts of the campus available to anyone interested in learning more about native plants and how they change with the seasons and over time.

Either small groups of students or individuals will be assigned one species to monitor for phenological changes during the module. If they are assigned a plant species, they will be required to monitor 3-5 individuals to monitor; if they are assigned an animal species they will be required to spend a set amount of time weekly observing the species. For example, if the student(s) are assigned coast live oak to monitor, they will be able to investigate questions involving timing of flowering within a population, environmental factors that affect timing, interactions with pollinators or seed/fruit dispersers. If they are looking at animal populations they could examine the relationship between food source availability, and nesting success. Students will be required to collect data, maintain work logs and observation journals. In the majors Biology course, students will be required to develop a research project that investigates change over the quarter culminating in a presentation of their findings in poster, presentation and/or paper format. Grading would be on quality of data collection, conclusions and presentations of research findings. Students will be expected to formulate hypotheses regarding the subjects observed, and draw conclusions from testing and communicating results of those test and critically evaluation the results. Students will also be expected to apply evolutionary theory to explain the unity and diversity of living organisms.

FOOTHILL COLLEGE Module 3 Summary: WATER WISE PLANT ADAPTIONS

An important component of sustainability is an understanding and appreciation of the environment and the natural resources it provides, which includes an understanding of local biodiversity found in natural communities. Students are introduced to common chaparral plants present in the Foothill College Native Plant Garden. Through a combination of lecture, direct observations, small group and class discussions, students learn about features characterizing chaparral communities and adaptations typical of chaparral plants, particularly adaptations associated with water conservation. The activity focuses on evolutionary processes and biodiversity as a component of sustainability, and considers the merits of using native species in sustainable landscaping with an emphasis on water-wise plantings.

- Discuss the concept of sustainability (social equity, economic vitality, environmental integrity)
- Define biodiversity.
- Explain how the evolutionary process of natural selection generates biodiversity.
- Recognize and identify the chaparral community and representative plants.
- Discuss the potential merits of landscaping with native plants
- Contrast regions of campus with native, water-wise plantings to those with water-intensive lawn plantings

Students will review the environmental conditions of the region, learn about plant physiology and morphology and then make field observations of plants to identify what they feel is an adaption for water conservation. Students will also be expected to compare and contrast the water use of a chaparral area and a typical landscaped area on campus. Students will be required to collect data, maintain work logs and observation journals. Students will be expected to formulate hypotheses regarding the subjects observed, and draw conclusions from testing and communicating results of those test and critically evaluation the results. Students will also be expected to apply evolutionary theory to explain the unity and diversity of living things.

SJSU MODULE 1 SUMMARY - MLK LIBRARY GREEN BUILDING

The Sustainability at the King Library module introduces the major LEED categories that buildings applying for LEED certification for Operations and Maintenance are reviewed. The goal of the module is to provide a basic overview of criteria used for each LEED category. The module's goal is to have students' rate the library's features via a physical tour and an online tour to discover sustainable features. The module asks the students to explore the building, discover how people use it, and to apply their understanding of LEED's categories to sustainability in their own lives and living environments.

The module is an online tool available from the SJSU King Library's Research Guides. Anyone can access the guide on and off campus. The module can be linked to from your course management system, or you can provide the url to students in your class. The module covers three sessions of class time: an short introduction to the topics of sustainability and the 3 E's, a student self-tour of the King Library, and a final session (lecture or student presentations) to summarize the aspects of the King Library that apply to each LEED category. Students use a sample worksheet that approximates the official checklist used by LEED certified professionals to evaluate the library's LEED features. The length of the module varies depending on whether you want to present a group lecture as the final activity or if you choose to have students present their discoveries about the King Library's LEED features.

Length of time for Module: 2 hours – 2 1/2 hours

Modules Summary: There are nine sections in the module.

- **Introduction: Sustainability and the 3 E's:** A basic overview of the definitions of sustainable and the 3 E's.
- **Introduction: LEED Certification:** A basic overview of what LEED is through websites and a video.
- **LEED category: Sustainable Sites:** Links to the history of the SJSU Library and the San Jose Public Library history. An introduction to sustainable transportation.
- **LEED category: Water Efficiency:** Link to the SJSU's webpage on water use and recycled water that contains data on the library's recycled water use.
- **LEED category: Energy & Atmosphere:** Students begin the inside tour of the library from the 8th floor to the lower level evaluating the library's energy use and atmosphere.
- **LEED category: Materials & Resources:** Students are directed to take the online tour of Mel Chin's Art and then a physical tour to identify where the recycled art is located.
- **LEED category: Indoor Environmental Quality:** Students take a physical tour as they evaluate the library's features that fall in this category.
- **LEED category: Innovations in Operations.** Link describes the ways that buildings can meet the criteria for innovative operations.
- **Additional resources: The Green Ninja and more info:** Links to other resources for classroom instruction or additional resources: links to LEED information, California LEED groups and buildings, library sustainability links and blogs

SJSU MODULE 2 SUMMARY - SUSTAINABLE AGRICULTURE GARDEN

Student Learning Objectives:

- **All Campuses: GE Area B2, Student Learning Objective 1:** Students should be able to *use the methods of science and knowledge derived from current scientific inquiry in life or physical science to question existing explanations*
- **SJSU Only: SJSU Studies Area R, Student Learning Objective 2:** Within the particular scientific content of the course, a student should be able to *distinguish science from pseudo-science*

Lesson Overview:

Using the Sustainable Agriculture Garden at SJSU as a small-scale, local example of sustainable food-growing practices, students will discover how these methods differ from those used in conventional farming, all within the context of and relation to closed-loop material cycling and biodiversity. Discussion will also center on genetically modified organisms (GMOs) and the risks they can pose to the environment. A selection of journal articles on GMOs from the academic, scientific literature will serve as the foundation for evaluating whether information is sound science or pseudoscience. Several potential assignments and writing activities are provided, along with links to scientific journal articles and other related materials. The lesson plan is written to help the instructor learn about the topics and provide a detailed plan for delivering content. The lesson can also be modified to suit different subject areas. Contact the Lesson Mentor for suggestions.

Lesson Location:

- Brief introduction in the classroom the week prior to field trip
- Main content and activity presented in the Sustainable Agriculture Garden at San José State University (see full lesson for list of materials)

Lesson Duration: Approx. 1 hour 15 minutes, with options to increase.

Key Concepts: (subject to instructor's choice of material)

- Students will learn about **closed-loop materials cycles in nature** and **how these apply to human food system**.
- Students will learn **how biodiversity** and **species interactions apply to human food systems**.
- Students will learn **definitions of sustainability**.
- Students will learn **basic principles of sustainable agriculture**, with focus on it being a closed-loop system.
- Students will learn the **definitions of conventional, organic, and genetically modified food** in context that **highlights their differences and varying environmental impacts**.
- Students will learn how to **decode food labels** and **ingredient lists** and **determine which may be genetically modified**.
- Students will learn how to **gauge sustainability of a food item**, with emphasis on where and how it was grown.
- Students will learn **what types of food can be grown in Santa Clara County** and **how to read seed packets** to determine this information.
- Students will learn how to **distinguish between unbiased, objective articles and clearly biased ones in the academic, scientific literature**.

SJSU MODULE 3 SUMMARY- THE CENTRAL ENERGY PLAN COGENERATION

Student Learning Objectives:

GE Area B1, Student Learning Objective 2: Students should be able to *demonstrate ways in which science influences and is influenced by complex societies, including political and moral issues*

Lesson Overview:

In preparation for a tour of the Central Energy Plant at San José State University, this pre-field trip lesson serves as an introductory overview to the topics of renewable vs. non-renewable electricity sources, basic units of energy and power, energy equivalents and efficiencies, electricity production and consumption, and greenhouse gas emissions and their contribution to global climate change. A brief introduction to SJSU's Central Energy Plant, namely their co-generation plant and cooling towers and what makes each sustainable, is provided. A variety of assignment options is included, some geared toward performing calculations and some not. The lesson plan is written to help the instructor learn the basics about the topics and/or augment existing knowledge as well as to provide a detailed step-by-step plan for content deliverance. The lesson can also be modified to suit different subject areas. Contact the Lesson Mentor for suggestions.

Lesson Location:

Main content presented in the classroom via a PowerPoint Presentation the week prior to the field trip to the Central Plant at San José State University, serving as an introduction to the topic. Internet access needed

Lesson Duration: Approx. 1 hour 15 minutes

Key Concepts - Students will learn:

- the **basics about different sources of electricity**, including whether they are renewable and/or sustainable or not;
- **basic units of energy, power, and energy equivalents;**
- the **basic differences between levels of efficiency of different energy sources;**
- about **production & consumption of energy in the US**, with a **special focus on California;**
- that **different energy sources produce varying amounts of emissions;**
- the **basics** of what the **greenhouse effect** is, what **greenhouse gases** are, and what is their **contribution to global climate change;**
- the **basics about SJSU's Central Energy Plant**, highlighting both its **co-generation** and **cooling tower** facilities;
- about the **Cheng Cycle;**
- **how the co-generation plant and cooling towers are considered sustainable** and how they **might change as technology improves;**
- how to research and evaluate **potential solutions** to the plant's aging technology.

Appendix 3: Campus as Living Lab Workshop Agenda (2 pages)

Campus as Living Lab Workshop Agenda

April 25, 2014, 10:00 - 3:00pm
Martin Luther King Library, Room 213
San José State University
San José, CA 95192

Attendees: a) ~ 30 participants, ~10 from each campus
b) CLL colleagues:
De Anza: Kristin Jensen Sullivan, Liz Flores-Lathan, Lisa Templeton
Foothill: David Sauter, Lisa Schultheis, Gillian Schultz
SJSU: Lynne Trulio, Peggy Cabrera, Gina Bacigalupi

Background:

San Jose State University (SJSU), Foothill College and De Anza College are collaborating on a unique project, called the Campus as a Living Lab, to infuse sustainability deeper into the curriculum at our institutions. This project is funded by the California State University Chancellor's Office and is focused on using physical sustainability features on our campuses to promote sustainability. We have developed a series of 9 one-session teaching modules (1hr 15 min to 3 hours each) that faculty can use to incorporate sustainability into their courses. Each module focuses on a physical feature at SJSU, De Anza or Foothill College. All modules are designed to address specific General Education student learning objectives and provide students with an active, hands-on experience. At the April 25 workshop, faculty from the three campuses will come together to learn how to use the teaching modules, discuss teaching methods, and tour the sustainability features at SJSU.

All workshop participants are expected to incorporate at least one of the modules into a course they will be teaching in the 2014-2015 academic year. A \$200 stipend will be awarded when participants provide a greensheet for a course they will teach that includes at least one Campus as a Living Lab teaching module.

Materials for the workshop can be found on this website:

<https://sites.google.com/a/sjsu.edu/participants---campus-as-living-lab/>

AGENDA

10:00-10:30 Introduction

- Introduction to the Campus as Living Lab and the Workshop
- Introduction to sustainability across the curriculum
- Agenda
- Expectations of participants
- Introductions - your name, campus, courses you teach and what you would like to get from the workshop

10:30-11:30 Overview of the Modules

- Each module developer will give a 5-minute overview of their module
- Presentations will briefly address these points:

1. What is the primary objective of the module (learning outcomes)?
2. How would you suggest it is presented (classroom, field, combination)?
3. How much time do you estimate it will take to present the module?
4. Are lecture and support materials available for anyone who wants to use the module?
5. Are there exercises and/or activities available for anyone to use the module?
6. Is there information that needs to be given to the students ahead of module presentation?
7. Are there follow-up activities or will the module be completed in one session?
8. Will the module require advance preparation by the instructor? (Is this information provided? Who is the contact person?)

11:30-12:00 General Discussion - Questions and discussions on using the modules

12:00-1:00 Lunch and Group Breakouts

- Break into groups focused on using specific modules
- Discuss how to use the module in your course - What elements appear to useful to you? What would you need in the module to use it?
- Module developers will sit with each group and collect suggestions

1:00-1:45 Report out from each Group

1:45-2:00 Wrap up

2:00-3:00 Tour of SJSU Campus as Living Lab Module Sites

- MLK Library Green Building - Guide: Peggy Cabrera
- Sustainable Agriculture Garden - Guide: Gina Bacigalupi
- SJSU Cogeneration Plant - Guide: Gina Bacigalupi

The 9 Modules are:

De Anza KIRSCH CENTER GREEN BUILDING

De Anza FOOD & INTEGRATED WASTE

De Anza CHEESEMAN NATIVE PLANT COMMUNITY GARDEN

Foothill PHENOLOGY

Foothill HOME COMPOSTING

Foothill WATER WISE PLANTS

SJSU MLK LIBRARY GREEN BUILDING

SJSU SUSTAINABLE AGRICULTURE GARDEN

SJSU COGENERATION PLANT

Appendix 4: Module Evaluation Worksheet (1 page)

**CAMPUS AS A LIVING LAB
Workshop Worksheet**

Name:

Department:

Course(s) Targeted:

Semester(s):

Your Contact Information:

Modules of Interest:

Why this/these Modules?

What components of the modules work well for you?

Are there elements you need to see in the module(s) for you to use them?

What recommendations do you have for us for improving the modules?

General recommendations or thoughts?