California Polytechnic State University, San Luis Obispo

From the SelectedWorks of Margot McDonald

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Education for Sustainable Energy Careers

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Available at: https://works.bepress.com/mmcdonal/3/
Education for Sustainable Energy
Designing for the Built Environment
SOLAR 2007
Background

Margot McDonald AIA LEED AP (Cal Poly, San Luis Obispo)
Professor of Architecture
Sustainable Environments Minor Advisor
Co-Director, Renewable Energy Institute
Co-founder, SuRGE
Collaborator, edGE
Member, ASES Board of Directors
Chair, USGBC Formal Ed Committee
Ad-hoc Advisor, AIA Education Initiatives
Typology of Green Building Curriculum

**Educational Settings**
- Non-professional workshops
- Professional workshops (CEU credit)
- Formal college or university courses

**Topical Areas**
- Natural Building
- Ecological Building
- Green Building
- Whole Bldg Systems
- Multi/Inter/Cross-disciplinary Design
- Green Building Rating Systems
- Specific Technologies/Techniques
- Bldg Commissioning
- Bldg Deconstruction
Buildings as Pedagogy

Place-based
  local/regional
  bio-geography

Problem-oriented
  contemporary issues

Participatory
  experiential
  hands-on
  community engagement
Sustainability Curriculum Initiatives in AE

Curriculum Projects

Vital Signs (UC Berkeley)
Agents of Change (U of Oregon)
EASE (Ball State University)
SEDE (Cal Poly-SLO)
Educating Global Engineers (edGE)
AIA Sustainability Toolkit
USGBC Formal Education - BIM Curriculum
SBSE 2010 Educational Initiative
Vital Signs - UC Berkeley (Benton et al)

Curriculum Projects

Faculty Development
Hands-on Training
Adaptable Teaching Materials
Protocols for Post Occupancy Evaluations
Equipment for Measurement
Field Studies
Sustainable Environmental Design Education: Professional Education for Architects + Landscape Architects

**Definition (SEDE):**
“Sustainable environmental design” consists of the principles and practices of architecture and landscape architecture that protect environmental quality and human health, reduce environmental impacts resulting from physical changes to buildings and landscapes, and improve the life-cycle economics of natural, human, and financial investments in the built and natural environment.

http://www.calpoly.edu/~sede/home.html
Ecological Design Flowchart

YEAR 1
I. Foundation design
   - Natural, cultural + aesthetic systems
   - Natural, structural + material systems
   - 1f, 2f, 5f, 6f

YEAR 2
II. Site and microclimate design
   - Natural, energy + bio resources
   - 4f, 8f

YEAR 3
III. Building and landscape ecology
   - Cultural, economic + legal systems
   - 3f, 7f

YEAR 4
IV. Constructability and Economics
   - ALL systems + resources
   - 9f, 10f

YEAR 5
V. Comprehensive Design

Grey circles represent additional elective courses.
(Click on numbers (e.g., "2f"), to see more on topic.)
Survey: Sustainability Course Topics

Question #9. What topics are covered in these sustainable environmental design courses?

Topics Covered

- Design + planning: 37%
- Conserve + conversion: 71%
- Indoor enviro quality: 69%
- Material selection: 67%
- Process / documents: 42%
- Waste reduction + resource recovery: 59%
- Water conservation + reuse: 62%
- Economics: 32%
Basis of Ecological Design Education

You can’t solve a problem with the same mind that created it. -Albert Einstein

Alan Berkowitz defined “ecological literacy” as (Understanding Urban Ecosystems, 2003):

- **scientific** (evidence-based and critical thinking), **systems** and **hierarchical** thinking
- **temporal** (short-term, historical and evolutionary) and **spatial** thinking (geographical, place-based and contextual)
- **trans-disciplinary** thinking
- **ethical, creative, and empathic** thinking
WHAT DO YOU EAT?
A Cal Poly Farm to College Project

Problem

As a group, we have set out to investigate the food sources here at Cal Poly. It has become clear that our campus needs our help to reach sustainable goals. Our goal throughout this project has been to increase the sustainability of our community by analyzing and holistically rethinking the role of Cal Poly in food acquisition and consumption.

Food sources on campus are unsustainable in many ways, and we see these issues as problems in three distinct areas of environmental, social and economic problems.

Environmental problems include the pollution caused through packaging and transportation, damage to soil and water, as well as an unnecessary amount of fuel consumption.

Social problems include the exploitation of people and their resources, the spread of toxic chemicals to humans, a reduction in nutritional value, and the possible use of GMO’s.

Economic problems include the support of large corporate farms and the exportation of money out of our local economy.

OUR PROPOSAL
IS TO BUY LOCAL!!

Edes 408, Winter 2005
Presented by The Cabbage Patch Kids Group:
Allegro D’Albert, Karlo Felix, Haley Gipe, Katie Hergenrather, Nick Ladd
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Findings

As we began our research we found that our problem involved many different complicated factors. The issue of which products the campus needs when, and when they are produced locally became very complex. We decided for simplicity sake we would focus our project on tomatoes and lettuce. After narrowing our project scope it became more realizable that our implementation concepts could actually be used someday.

Currently our food originates and travels within a food system that is global, not local. Food in the United States travels an average of 1,200 miles from farm to plate. That's approximately the distance between New York and Dallas—for every bite! For every dollar spent on food, only a fraction—20 cents on average—goes back to the farmer. The rest goes for transportation, packaging, marketing, wholesalers and retailers. (Taken from Omnivore America)

We reached out to the local farmers to investigate what can in fact be grown here in our county. One of the unique features of this beautiful regional environment that we live in is all of the many ecosystems we have for growing food. We compiled this general growing information as well as the information for one local farm in particular, Clark Valley Farm. When we set out to interview local farmers, Clark Valley Farms responded with an eagerness to educate us as well as work with us. This local farm could be a great response to our problem not only due to their long growing season of lettuce and tomatoes but also their willingness to become involved in our project.

The Organic Farm here on Campus produces 3% of the demand for Tomatoes, which is a potential of $2000 annually in local revenues. The farm alone could provide Cal Poly with all of its lettuce for over 7.5 months during the year, as well as all of its mixed greens for over 10 months.

Desire for an Organic Establishment

We also decided early on that it would be useful to investigate the desire for organic food on campus. We conducted a survey of 100 individuals on campus including students of all levels, faculty and employees to find out what people thought about organic food and how much more they would pay for a good, locally grown organic salad.
WHAT DO YOU EAT?
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Strategies

Our project in no way is intended to be a complete solution to all of Cal Poly's food consumption problems. Rather, it is intended to show the feasibility of creating positive change and promoting a dialogue about the numerous possibilities that do exist. There are many efforts going on across campus to increase sustainability, this project is just one of them. The biggest conclusion that we have reached is that the only way change will start to happen on this campus is if it is driven by us, the students, and powered by the help of administration, faculty and employees of this great campus we all

We propose to influence change mainly through education. We designed table tents that could easily be used in the various food establishments on campus to spread awareness about the positive aspects of eating locally grown, organic food. We also decided that labeling food with comparison information as well as health and nutritional benefits would be another great way to educate individuals on what they eat here on campus.

It would also be great to see a campus organic food sales program. This program could include an organic salad bar or a taste test booth. There is also a great chance for student involvement in helping to market the Cal Poly Organic Farm, or even a new menu design to include organic foods at establishments on campus already.

Another great education event would be educational food demonstrations. We thought an "Organic Food Demo Night" would be a great way to integrate socializing and education all centered around great tasting organic food. A "Learn by Cooking" seminar would be another great way to teach individuals about how to cook great tasting organic food, as well as sticking to the Cal Poly motto.

Our ideas were adopted and altered from real-world proven tactics that are working and used at the University of Wisconsin, Madison in their "Farm to College" project.

Universities with Farm to College programs:
- Cornell University
- Iowa State University
- Kansas State University
- Michigan State University
- UC Davis
- UC Santa Cruz
- University of Maine
- University of Minnesota
- University of Nebraska
- University of New Hampshire
- University of Wisconsin
- Washington State University

The incentives are all positive for buying locally grown organic foods. Environmentally it is better for the soil, air and water. Socially it can result in safer working conditions as well as more nutritionally valuable foods. Economically it can increase profits and keep revenue local. All in all, buying locally just seems like the right thing to do.

So are you ready to see some change?

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TriAD curricular approach is built on proven principles that have been shown to be effective in achieving higher retention of underrepresented individuals in engineering and promoting deeper learning in the students:

• providing meaningful context (i.e., a “real world” application)
• integrating concepts from math, science and technology
• emphasizing active learning and design
• facilitating meaningful connections among students
• promoting reflection and self-assessment of learning, and,
• creating significant interaction between students and faculty, with faculty acting as coaches.

http://www.mate.calpoly.edu/quest/triad.php
http://edge.calpoly.edu/news-early.html
Client Functional Requirements

Situational conceptual design for display in Power House
Examination of energy lifecycle

- Generation/production
- Transport/distribution
- Consumption/use
- Reuse/disposal

socio-cultural, economic, environmental, and historical impacts
Educational Outcomes

Create an informed, engaged, solution-oriented citizenry who possess the technical knowledge, design capability, and societal awareness to face the challenges of the future and that leads the students to become change agents for society’s needs.
Conclusion

You must be the change you wish to see in the world.  
-Gandhi