



Engaging Science in Our Global Future:

Project Pericles' Civic Engagement Course (CEC) Grant Program

Civic Engagement in Science:

A strategy to address problems in science education

Prof. Adrian Hightower
Occidental College Physics Department
Los Angeles, CA, U.S.A
hightower@oxy.edu

<http://faculty.oxy.edu/hightower/>



Connecting Science Courses to Community

- Students apply what they learn in the classroom to community projects
- **Philosophy of the Pedagogy of Engagement**
 - Work with Community Partners to Design Projects
 - Win Win Solutions
 - Outcomes are accessed by all parties
- **Benefits of the Pedagogy of Engagement**
 - Additional method to motivate students
 - Classroom skills honed on community projects (Field Skills)
 - Promote Problem Solving Skills and Critical Thinking
 - Students learn ethics in science.



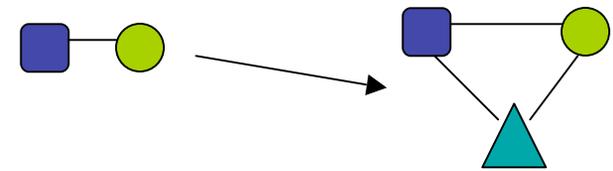
Challenges with Science-Based Community Projects

- More work for Instructors and Students
- Projects Require Additional Resources
- Relationships with Community Partners are not Trivial



Challenges with Science-Based Community Projects

- More work for Instructors and Students
 - Project administration and coordinating logistics is time consuming
 - Instructors efforts may to be recognized by traditional evaluation methods.
 - Students must be proficient in fundamentals for successful projects
- Projects Require Additional Resources
 - Travel, Equipment, Communication, Compensation
 - Teachers frequently dedicate personal resources to projects
- Relationships with Community Partners are not Trivial
 - Two-body problem → Three-body problem
 - Competing agendas
 - **Win! Win! Projects are challenging to design.**





Physics 168: Energy Conversions and Resources



- 1st physical science course at Occidental College with civic engagement component.
- Awarded Civic Engagement Grant, Project Pericles, NY
- Goals
 - Student recognize and quantify energy conversion processes important to industrial societies.
 - Students conducted energy audits for community partners

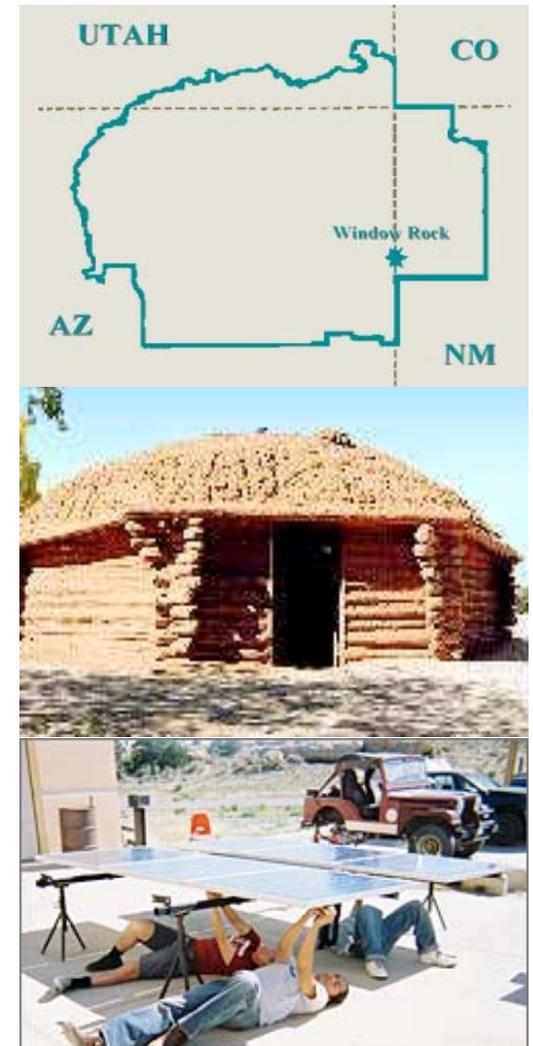




Physics 168: Energy Conversions and Resources



- **Results:**
 - Students conducted energy audits for community partners
 - Audubon Center, 1st platinum LEED facility in nation
 - Navajo Tribal Utility Authority and Sandia National Laboratories
- **Evaluations:**
 - Highest student evaluations of the Oxy Physics Department
 - The success of the community engagement measured by the degree to which community partners adopt recommendations of student projects.
- **Future implementations**
 - Course scheduled for Fall of 2009
 - Evaluate implementation of recommendations adopted the Audubon Center
 - Leverage LEED experience with green building movement in Los Angeles



2006 Mali Photovoltaics

- › Sponsored student research projects in Timbuktu and Bamako, Mali
- › **Kether Hayden** - gender and photovoltaic installations
- › **Tope Sosanya** - political aspects of security of solar panel installations..

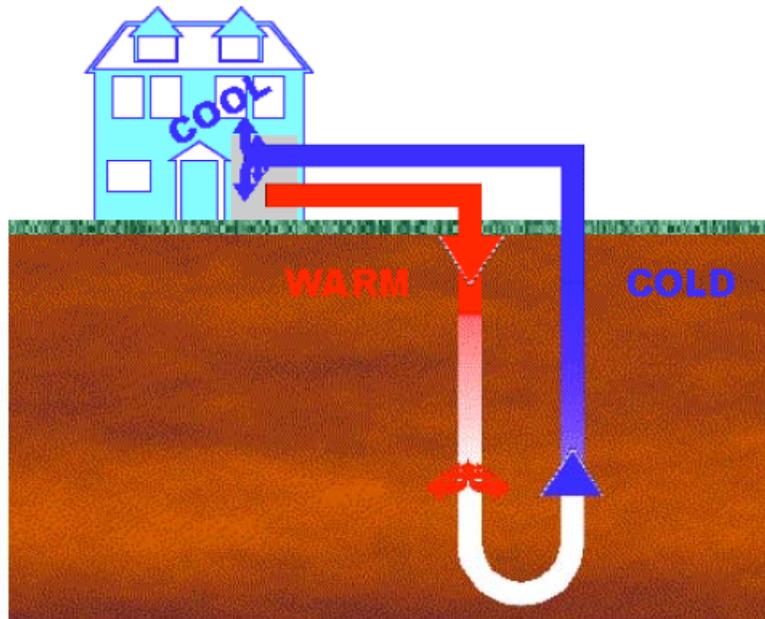


2007 Ghana Geothermal Cooling

- Collaborated with local teachers to install a geothermal cooling system on a Faith Community School, Accra, Ghana
- Use the ground as a heat sink to cool circulating air.

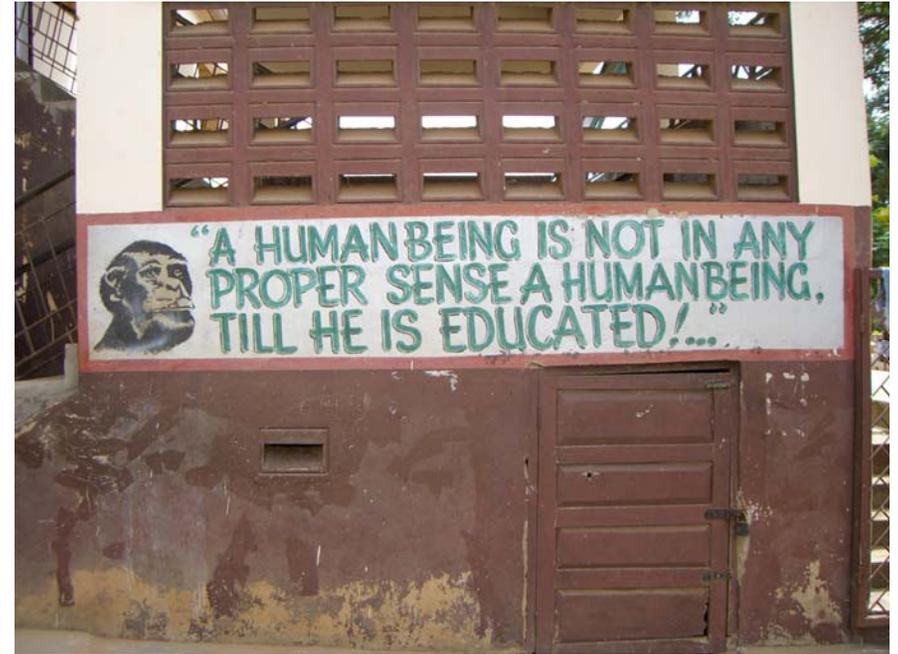


house temp:
88
outside air
temp:
95
ground temp:
55



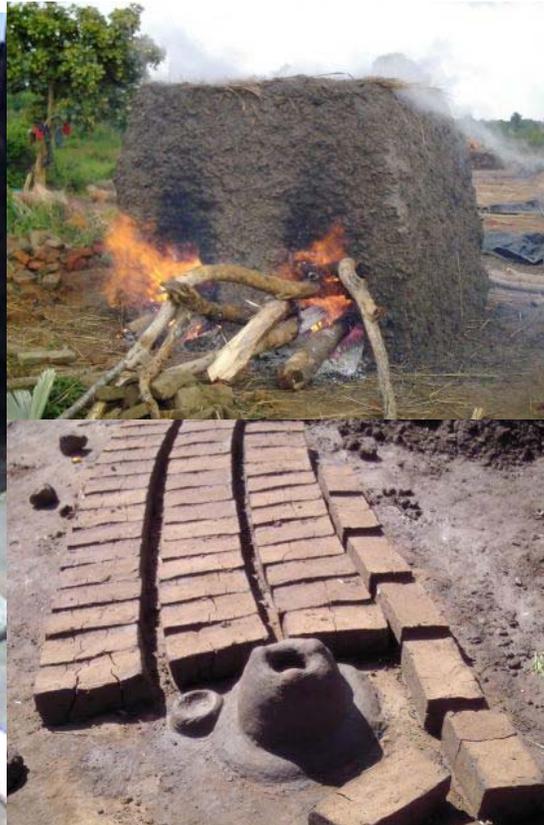
2007 Geothermal Cooling in Ghana

- Students learn from Students
- Ghanaian students collect data and email Oxy students



2008 Efficient Wood Stoves, Uganda

- Stoves made of clay composed ~50% vol. Biomass
- Stoves from porous clay stoves uses 40% less wood
- Incorporated into Occidental's Physics 250 Thermal Physics course
 - Students measured specific heat and thermal conductivity
- Two Oxy students awarded \$6000 Richter Fellowship to work in Uganda



The ELSI of the Genome

- Ethical, Legal, Social Implications of the Human Genome Project
- Team Taught
 - **Dr. John Esser*- Sociologist with legal background
 - **Dr. Ammini Moorthy* – Geneticist with ethics background
- Topics Covered in the Course
 - Evolution, Social Darwinism and Eugenics
 - Genetics and The Human Genome Project
 - Reproductive technologies and bioethics
 - Genetic testing and Gene Therapy
 - Criminology and DNA Forensics
 - Genetically Modified Organisms (GMO)
 - Race and Genography and Genetic Discrimination

Course Objectives & Student Responsibilities

● Objectives:

- Teach basic Human Genetics, Biotechnology and Genetic Engineering
- Encourage active participation in class discussions
- Explore the legal and social issues related to Biotechnology
- Debate whether the Eugenics movement is still with us
- Explore the impact of human genome research on society

● Student Responsibilities

- Professionally participate in class-room debates, really listen to opposite points of view and learn from them
- Frame the issues, analyze them objectively for the greater good
- Propose alternative solutions and advocate their preference in front of a critical audience

Paper on an Issue

Major Civic Engagement Component

- Introduction
 - Clearly stated issue
 - Context and technical overview
 - Scientific, legal, ethical and social considerations
- Logical Analysis
- Action Plan to Resolve the Issue
 - Research- and literature-based specific action steps
- Anticipated Outcome of the Resolution
 - Near-term and far-term implications considered
- Slide Presentation to the Class

Example: ELSI of Human Embryonic Stem Cell Research

● Identified Issues

- When does life begin?
- Is it a new form of Eugenics?
- Who owns the embryos?
- Commercialization of body parts
- Human rights and dignity

● Action Plan

- Consulting religious groups and legal experts
- Educating the Public
- Developing appropriate legislation
- Alternatives to using embryos (e.g. Adult Stem Cells)

● Outcome Assessment

- Sensitivity to religious freedom
- Informed Individuals will make better decisions
- Proposal of alternatives indicates pragmatism

Accomplishments and Areas for Improvement

● **Accomplishments**

- Increased student awareness of ELSI issues
- Developed ability to do independent research leading to policy stands on critical civic issues
- Improved communications and debating skills

● **Areas for Improvement**

- One semester is too short to delve deeply into crucial topics in this important area
- Need to use more of a multi-media approach to enhance learning
- Not adequately integrating the religious and philosophical implications

Instructors' Perspective

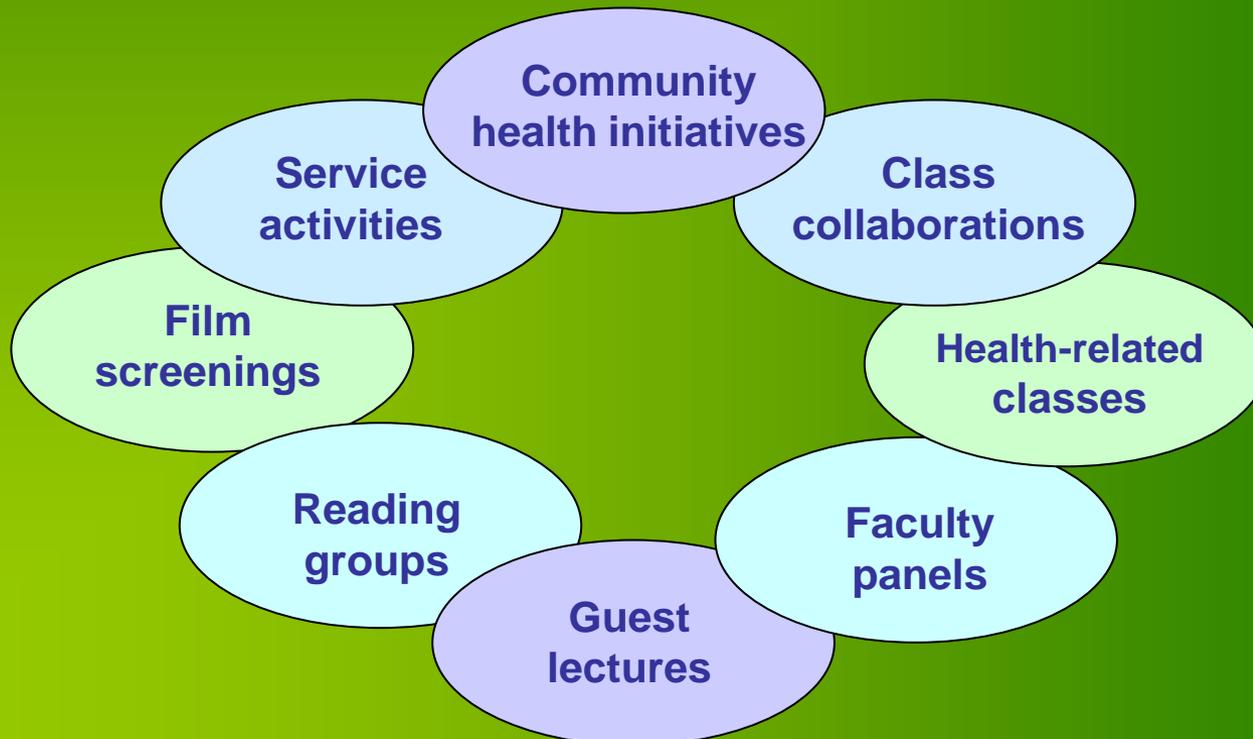
- Team teaching is essential since civic engagement issues tend to be multi-disciplinary
- Issue-based reflective form of writing in this course (as opposed to a purely scientific form of writing) stimulates the students to think of social problems stemming from development in the sciences and to take a stand on solutions
- Class discussions and slide presentation improve the students' communications and debating skills
- The course format can be replicated to cover other scientific and non-scientific disciplines and related social issues

Year of Health



Join Allegheny in a year-long exploration of health through multiple disciplinary lenses.

Mechanisms of Engagement



Mission Statement



The Year of Health is designed for Allegheny campus and community members to:

- examine health on the global, community, campus, and individual levels
- explore key factors that contribute to ill health, such as:
 - access to health care and health / risk disparities
 - environmental, physical and genetic contributions to disease
 - ethics and policies that impact health and health care
 - how individuals and media portray and contribute to health and disease
- evaluate local, regional and global strategies to improve health



Key Themes



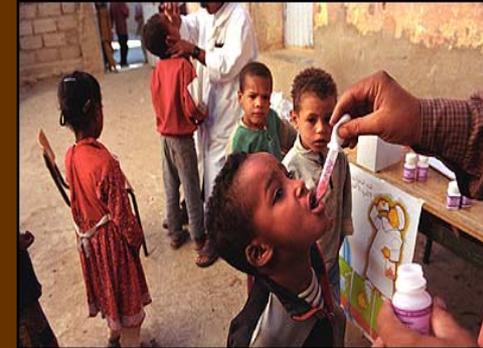
Personal
Wellness



Community
Health



Environmental
Health



Global
Health



Caryl Waggett
Environmental
Science



Ron Cole
Geology



Vesta Silva
Communication
Arts



Melissa Comber
Political Science



Water & Health
Collaborative



Physical Geology

Class Size: 28

Student body:

Geology majors, and non-majors fulfilling science distribution

Environmental Problem Solving

Class Size: 20

Student body:

Env Sci majors, and non-majors fulfilling writing distribution

Logistics of a Four-Course Collaboration

- Hand-pick colleagues
- Plan one year in advance
- Arrange classes to meet concurrently
- Select topic for broad applicability
- Allow each faculty to spearhead different aspects of collaboration
 - Anticipate student anxieties
- Provide opportunity for reflection

Rhetoric and Civic Engagement

Class Size: 15

Student body:

Advanced majors and minors with little disciplinary training

Health Policy

Class Size: 35

Student body:

Advanced political science majors and pre-med students

Water & Health
collaborative

Partners



Steering Committee

- Caryl Waggett, Environmental Science
- Dave Roncolato, ACCEL
- Kirsten Peterson, Pre-Health Programs
- Ron Cole, Geology
- Vesta Silva, Communication Arts
- Melissa Comber, Political Science
- Jaqueline Kondrot, Office of Wellness
- Duane Koller, Meadville Medical Center
- Mike Downing, Community Health Services
- AnnaLiisa McGlinn, Oncology Wellness Institute
- Barb Steadman, Public Affairs
- Sue Plunkett, Health Center
- Betsy Miller, Athletics
- Jane Ellen Nickell, Office of Religious Life
- Sonja DeJong, Student Coordinator
- Hillary Bedell, Student Intern
- Krysl Castillo, Student Web Manager

Funding and Support

- Project Pericles
- Demmler Award for Teaching Innovation
- Public Health and Liberal Education program;
- Public Health and Educated Citizen program;
- American Association of Colleges and Universities (AAC&U)
- Association of Prevention Teaching and Research (APTR)
- Allegheny College
- US Environmental Protection Agency
- Council of Environmental Deans and Directors (CEDD)
- Crawford Heritage Foundation
- Meadville Medical Center
- Community Health Services
- Oncology Wellness Institute

