
Educating Global Engineers

A Project-Based Team Approach

at

Rowan University

Z. Otero Gephardt
9th Annual International Colloquium
on
International Engineering Education
Newport, RI
November 2 – 5, 2006

Educating Global Engineers

A Project-Based Team Approach

at

Rowan University

- **Global Service Learning in Engineering Clinics**
 - **Service Learning and Internationalization Philosophy**
 - **Rowan Students in El Salvador**
 - **Rowan Students in Chile**
-

Rowan College of Engineering International Initiatives Committee

- John Chen, ME
 - Z. Otero Gephardt (chair), ChE
 - Craig Katz, International Student Services
 - Shreekanth Mandayam, ECE
 - Yusuf Mehta, EWB
 - Mariano Savelski, ChE
 - Ed Smith, International Center
 - Beena Sukumaran, CEE
 - Dianne Dorland, Dean of Engineering
-

Internationalization of Engineering Education

- Study Abroad
 - Short Courses/Excursions
 - Joint Projects with Universities
 - Joint Projects with Industries
 - *Engineering Clinics – Undergraduate Projects with Academic Credit*
-

Rowan Engineering Clinics

- Required engineering project based courses
- Students take engineering clinic every semester

Year	Content
First	Basic engineering applications of mathematical and scientific principles
Sophomore	Engineering applications integrated with writing and public speaking
<i>Junior/Senior</i>	<i>Projects (externally funded) with industrial/social relevance</i>

Standard Global Education Benefits

Most engineers will work for international companies

- Well-rounded
 - Able to work in multicultural environments
 - Globally aware
 - Marketable
 - Better employees
-

What do Engineers Do?



■ Improve Quality of Life



Engineers as Change-Agents for Peace

- Quality of life improvements play key role in peace

meeting basic needs + respect for culture

Commonality

Peace

```
graph TD; A[meeting basic needs + respect for culture] --> B[Commonality]; B --> C((Peace));
```

The diagram illustrates a conceptual flow. At the top, the text 'meeting basic needs + respect for culture' is positioned. Two arrows originate from this text, one pointing down and to the right towards the word 'Commonality', and another pointing down and to the left towards a yellow oval containing the word 'Peace'. The word 'Commonality' is written in a bold, black, sans-serif font. The word 'Peace' is written in a blue, italicized, serif font inside the yellow oval. A horizontal gold line is located at the bottom of the slide.

Engineers Play a Role

- **Basic Needs:** Engineers are uniquely qualified to help in numerous areas (water, food, shelter, education)
 - **Respect:** Engineers have a Code of Ethics
 - **Commonality:** Engineers can find similarities in apparently dissimilar entities
-

Global Engineering Education

- Doing well by doing good (Franklin)
- Each individual is part of a whole
- World's people are interconnected
- I cannot be what I want to be until you can be what you want to be (King)



Global Engineering Education

- Adaptability (technical and social) – what is learned in host country can be applied in the classroom
 - Attract underrepresented students
 - Technology as a vehicle to social justice and empowerment
-

Rowan Students in El Salvador

(with EWB)

- Challenge: To design and assist in the installation of a water tower and a water delivery system for El Amaton (near Guatemala border)
- Team: 5 students (2 ME, 3 CEE)
2 faculty (CEE, ChE-fluent in Spanish)
- Travel 8/26 – 9/3/06
 - land survey
 - community survey
 - water quality



Rowan Students in El Salvador

- Traveled to El Amaton from San Salvador with Peace Corps volunteer and community leaders
 - Lived in community (church building)
 - No running water
 - Meals with different families every day(\$25/day)
 - Participated in community activities
 - Brought materials for community school
-

Rowan Students in El Salvador

- Introduced at community meeting
- Listened to comments and discussion
- Explained scope of work during visit and answered questions
- Recruited community volunteers to assist with measurements and survey



Rowan Students in El Salvador

- Land survey – completed

- Community survey - Water Use



Peak Hours

Ability to Pay

Local Aspects

- Water Quality Measurements

Chorro

River during dry season

Rowan Students in El Salvador

- **Adaptability** (solar, wind power) and technical principles
 - **Social justice** – girls responsible for family water and often miss school
 - **Quality of life** – health, more time for better family care
 - **Three alternatives to be presented to the community by March 06 for community selection**
-

Rowan Students in Chile

- Joint project with La Universidad Catolica del Norte Sede Coquimbo
- Optimization of abalone aquaculture – fluid mechanics, process control
- Worked directly with independent abalone farmers



Rowan Students in Chile

- Traveled 1/3 – 1/30/06
- Lived on campus
- Worked in university laboratories
- Part of a university team



Rowan Students in Chile

- Taught short course on airlift technology to abalone farm technical and administrative personnel
 - Measurements on university pilot scale tanks
 - Measurements on industrial size tanks at three different farms
-

Rowan Students in Chile

- Invited presentation at Meeting of Society for Recirculating Aquaculture
 - Suggestions for improvement to independent farmers
 - Traveled and participated in activities with Chilean team
-

Rowan Students in Chile

- Benefited UCN/industrial collaborations
 - Significant technical learning for Rowan students
 - Students learned by teaching
 - Adaptability (technical and social)
 - Exposure to international small business
 - Assistance to independent business people
-

Global Engineering Education

- Sense of the commonality of the world's people and our interdependence
- Sense of responsibility to improve the quality of life for people worldwide
- Technology can be an important part in the road to peace and social justice
- Adaptability
- Do well by doing good





Thank you

