Panel 1: Making Engineering Ethics Relevant to Students and their Future Careers

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(By courtesy) Engineering Education
Until recently, Co-Director of EPICS
Service-learning design courses that meet human, community, and environmental needs

- Engineering-centered
- Multidisciplinary
- Vertically-integrated
- Student-led
- Projects can span multiple semesters
- Students can participate multiple semesters
By the numbers

500+ students per semester

1st Year – 4th Year Students

90+ Active Community Projects

300+ Deployed projects

50+ majors

3000+ alumni

21 years
EPICS - Example Projects
EPICS Design Process – Human-Centered

- Project Identification
  - Needs Assessment
  - User Analysis
  - Observation
  - Brainstorming
  - Research
- Specification Development
  - Conceptual Design
  - Detailed Design
- Delivery
  - User Training
  - Prototyping
  - Field Testing
  - Scenarios
  - Usability Testing...
- Redesign
  - Stakeholders
  - Service Maintenance
  - Retirement
Engineering Ethical Reasoning Instrument (EERI)

• NSF TUES grant with IIT, Lehigh, Michigan Tech, and Purdue (DUE-112374).
• Follows format of DIT2
  • Scenarios – ethical dilemma
    • Decision: Should or would you xxx?
    • Rate and rank the importance of series of ethical issues in making the decision
  • Based on Neo-Kolbergian Developmental Schema
    • Self-Interest
    • Maintaining Norms
    • Post-Conventional
Dilemmas similar to what they might encounter on a student project team
  - Intended to be engineering discipline neutral

Currently form has 6 scenarios:
  - Housing Quality
  - Racing Car (for child with disabilities)
  - International Aid
  - Flood Control
  - Nurse Schedule Software
  - Water Quality
Curricular Approaches

• Team literature suggests teams use information that draw from common experiences. (Stasser & Titus, 1985; Larson, Foster-Fishman, & Keys, 1994)

• All students completed the instrument prior to the lecture

• In lecture, asked students identify the ethical issues from the scenario
  • First individually
  • Larger class discussion

• Discussed overarching frameworks or ideals

• Introduced a decision-making process
Everyday Ethics

• What are examples of the ethical issues that you can/do face in the every day design decisions of your project?
  • Safety
  • Sustainability
  • User friendliness
  • Human Subjects testing
  • What are others??

• What would you do if you faced an ethical issue on your team/in your project?
Reflection

• Guided Questions for Reflection:
  • What did I learn?
  • How did I learn it?
  • Why does the learning matter?
  • What will/could I or others do in light of this learning?

• Areas:
  • Personal and Professional Development
  • Social Impact
  • Academic Enhancement
  • Ethics

Source: Ash, S. L., Clayton, P. H., & Moses, M. G., Clayton. (2009). Learning through critical reflection: A tutorial for service-learning students (instructor version). (pp. 4-5 through 4-7)
Bridge

Safe
Structured
Engineering
Education

Real
Free
Service
Practice
Experience

I’ve seen this before!

Scenario

Practice
What characteristics of EPICS were key?

- Real projects, real customers, safe to explore
- Open-ended, student-led projects
- Multidisciplinary with a common goal

Together, these created:
- Authentic approximations of engineering practice
- “‘Enduring understandings’ (Wiggins & McTighe, 1998) of how to be an engineer
The framework – Design Threads

- Real projects, real customers, safe to explore
- Open-ended, student-led projects
- Multidisciplinary with a common goal
Being aware of the impact of educational, programmatic contexts (e.g., human-centered, entrepreneurial, community-engagement) on what issues we consider

Being aware of impact of particular emphasis (e.g., everyday ethics)

- Getting to “AND”??