Integrating Microethics and Macroethics in Graduate Science and Engineering Education: Developing Instructional Models

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Integrating Microethics and Macroethics in Graduate Science and Engineering Education

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- Develop integrated learning objectives for graduate students
- Apply learning objectives in four educational models
- Assess student learning
- Share knowledge and materials
Project Team

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Four Educational Models

Stand alone course
Technical course with embedded ethics content
Online/Classroom hybrid
Lab group engagement
Science Policy for Scientists and Engineers

• Offered as a one credit course
• Meets CHM 501 requirement
• Offer every semester
• Topic and focus of the course changes each semester
• Title the course on science policy for scientists and engineers to enhance the macroethical content and avoid student and advisor biases toward the E(thics) word
• Students choose half of the readings to ensure that we cover timely topics of interest to them
Fundamentals of Biological Design

- Micro- and macroethical content is included in a required technical course for scientists and engineers.
- Ethics is placed in context with other professional knowledge and skills.
- Model takes advantage of learning opportunities as they arise.
Introduction to Research Ethics

- One-credit course, previously taught in conventional classroom and focused on Responsible Conduct of Research (RCR)

- Converted to Classroom/Online Hybrid
  - RCR text replaced by CITI online modules
  - Classroom sessions refocused on case analysis and discussion
  - Topics expanded to incorporate consideration of macroethics (e.g. ethical issues in military research)
Lab Group Engagement

**Goal:** To create a place where expertise from various fields can be exchanged, discussed, debated, and *shared*; will create an environment where both ethicists and scientists learn more about the ethics of emerging technologies.

**Three Research Questions:**
1. Can ethicists gain access to information in laboratories about future technologies that are not readily available in other places?
2. Will this method provide an opportunity to help scientists and engineers understand the ethical and social implications of their work?
3. Will this method empower those who shape the direction of innovation to be more reflective on the social implications of their work?
Coordination Workshop

1. Consultants presented background of graduate education in science and engineering ethics
2. Description of four models
3. Discussion groups on issues and outcomes
4. Discussion groups on pedagogy
5. Discussion of assessment models
Examples of Microethical issues

• Identify students’ own interests and values
• Professional norms, e.g. objectivity, transparency, accuracy, and efficiency
• Realistic understanding of behaviors
• Challenges of reward structures
Examples of Macroethical Issues

- Role of sociotechnical systems in our daily lives
- Overlapping contexts of research – institution, profession, economy, society
- Ways to envision possible social implications of research
- Ability to identify values and stakeholder interests
- How different career paths lead to different implications and outcomes
Pedagogy for linking micro and macro

• Create space and opportunity to discuss these issues
• Illustrate chain of events between technical decisions and social change
• Encourage students to consider how their decisions affect others
• Demonstrate how small personal decisions shape group and institutional dynamics
• Demonstrate importance of moral imagination
Assessment

• Existing measures of moral reasoning:
  - Moral Judgment Test (MJT), Lind, 2002
  - Engineering and Science Issues Test (ESIT), Borenstein, Kirkman & Swann, 2005

• Study-specific outcome measures

• Student-instructor communication (post test only)
# Study-specific Outcomes

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<th>Knowledge of Professional Standards</th>
<th>Sensitivity to Ethical Issues</th>
<th>Ethical Reasoning</th>
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<td><strong>Microethics</strong></td>
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<td>Conflict of Interest</td>
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Thank You

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