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Expanding Ethics Education in Science & Engineering

Jane E. Fountain

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AAAS, February 2010
Two NSF-Supported Projects

- National Digital Library: Ethics in Science and Engineering – Beta Site (NSF 0936857)

- IDEESE - International Dimensions of Ethics Education in Science and Engineering (NSF 0734887)
National Digital Library in Ethics in Science and Engineering

ESENCe Beta Site

Jane Fountain, Professor of Political Science and Public Policy, PI
Marilyn Billings, Scholarly Communications Librarian, Co-PI
Jessica Adamick, Ethics Clearinghouse Librarian
Michelle Sagan Goncalves, Project Manager
Beta Site Library – Background

- America COMPETES Act
  - As of October 1, 2009, National Science Foundation (NSF) proposals must include a plan for appropriate training and oversight in the responsible and ethical conduct of research to graduate undergraduate, and postdoctoral researchers

- NSF Response includes online resources for institutions and researchers:
  - NAE OnlineEthics upgrades
  - UMass Digital Library Beta Site
Beta Site – Strategic Priorities

- Interdisciplinary
  - Include life, physical and social sciences, policy, and engineering

- International
  - IDEESE expertise and emphasis
  - Trans-national politics; cross-boundary organizations
  - Cross-cultural individual and social behavior

- Interactive
  - Web 2.0, digital commons and “next generation” web-based tools and apps
  - Knowledge sharing tools
  - Interactivity
  - Visual information; videos
  - Semantic web
Beta Library – Sample Content

- **Research**
  - Use social science research to inform our understanding of ethics: individual, group, organizational, networks, national, trans-national
  - Examine the antecedents of ethical behavior and misconduct
  - Empirically based best practices: expert consensus on effective ethics teaching and training

- **Training Materials**
  - Case studies, syllabi, teaching modules, training packages
  - Social science research underlying knowledge in ethics and RCR, e.g., mentoring, cross-cultural communication, lab culture, deception

- **Other Resources**
  - *Codes of Conduct*: professional societies and organizations in science and engineering
  - *Disciplinary Actions*: examples of how unethical behavior is handled at different universities (best and good practices; lessons learned)
ESEN Ce Site Features

- Records available through Google Scholar and OCLC’s WordCat
- Materials in shareable, exportable, and savable formats
- State of the art search interface
- Creative Commons licensing clearly indicates usage guidelines
- International authorship of materials
- International audience
- Web 2.0 Features:
  - Commenting on all records
  - RSS feeds available for all pages and search results
  - News and NSF RSS feeds coming into site
  - ESEN Ce blog on front page
  - Google maps mashup
  - ‘AddThis’ button on all records to share through favorite tool (Facebook, Twitter, Digg, etc.)
ESEN Ce Site Features (cont’d)

- Pushing out materials to users through Google Scholar
- Record features
  - ‘AddThis’ button to share materials
  - Links to publisher’s version of article
  - Connects users with their own library’s resources
  - Indicates author’s location
  - Allow users to comment on materials with or without attribution
Pushing Out Materials to Users Through Google Scholar

Responsible Use of Statistical Methods

L. Nelson, C. Proctor, C. Brownie - ethicslibrary.org

Responsible Use of Statistical Methods focuses on good statistical practices. In the introduction we distinguish between two types of activities: one, those involving the study design and protocol (a priori) and two, those actions taken after the results are known (post hoc). We note that right...

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Record Features

For our Study Question, we present an ongoing argument concerning the United States census and related statistical practices, asking if statistics should be involved in deciding where the census should be done.

Our faculty guides for this module are Larry A. Nelson and Natalia Gurchevich, Department of Statistics. We would like to thank Cindy Lintner of the NC State University Library for her article search assistance.

Recommended Citation
http://www.industry.org/sources/01

Topic
Data Management

Material Type
Teaching Module

Research Area
Engineering | Life Sciences | Medicine and Health Sciences | Physics | Mathematics | Social and Behavioral Sciences

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Comments by intense debate
Examples of ESENCE in Use

- Case studies from ESENCE collection in use at Macalester College, St. Paul, MN
- St. John’s University, New York City, required a free, click-through certification process
- Lesley University, Cambridge, MA using information to create a local certification program
Tracking Use of ESENCe to Improve Design and Use

- Analyze usage to improve the site
- Tracked using Google maps and IP addresses
  - International, U.S., by state
  - By materials
  - By search patterns

- Google maps mashup
  - [http://www.ethicslibrary.org/resources/map.html](http://www.ethicslibrary.org/resources/map.html)

- Projects page
  - [http://www.ethicslibrary.org/projects/](http://www.ethicslibrary.org/projects/)
California usage

www.ethicslibrary.org

State Detail:
California

Oct 1, 2009 - Jan 29, 2010
Comparing to: Site

Visits
1
237
VA Usage
www.ethicslibrary.org

State Detail:
Virginia

Oct 1, 2009 - Jan 29, 2010
Comparing to: Site
International Dimensions of Ethics Education in Science and Engineering (IDEESE)
IDEESE - An Interdisciplinary Team

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Scientists and engineers face two types of ethics challenges:

1. Responsible conduct of research -- the standards by which scientists and engineers conduct research or engage in professional practice

2. Social responsibility -- scientists and engineers are holders of particular expertise concerning applications of science and engineering knowledge in society
Rationale: Globalization of Science and Engineering

- Labs, organizations, and projects are increasingly global in scope
  - Thus, scientists and engineers need to understand how:
    - ethics and RCR may differ dramatically across countries
    - international consensus on ethical concerns is forged
    - how persistent differences in national preferences are handled
    - how national governments coordinate regulatory responses to transnational challenges in science and engineering

- But ethics education remains US-focused and poorly integrated into graduate curricula
International Dimensions Project: Objectives

- Research and develop education materials (in-depth case studies and analytical frameworks) to examine international dimensions of ethics in science and engineering

- Properties:
  1. **Accessible** to graduate science and engineering instructors
  2. **Insertable** by busy instructors into current science and engineering courses
  3. **Engaging** for graduate students with no previous ethics training
IDEESE – International Case Studies

- Reporting Incidences of SARS
- Bhopal Plant Disaster
- EU-US Dispute over Regulation of GMOs
- South Korean Stem Cell Research Scandal
- Intergovernmental Panel on Climate Change 2001-2009
- Narmada Dam controversy
- And others on our website
Example: Bhopal Case plus Teaching and Background Notes
http://www.umass.edu/sts/ethics/bhopal.html
A Modular Approach to Background and Teaching Notes

APPENDICES:

The Bhopal case includes 8 appendices, instructions should select and assign appendices appropriate to the module or learning objectives for the class session.

Appendix A: Chronology (356 KB, pdf): The chronology is a 17 page document outlining the events leading up to and following the plant explosion. Dates outlined range from 1956 to 2007. The chronology is also color-coded to aid in identifying key events, relaying the importance of the event, and changes in economic conditions.

Appendix B: Stakeholders and Level of Responsibility (461 KB, pdf): Appendix B is designed to encourage students to consider the perspectives of various stakeholders associated with the Bhopal disaster including the government, the UCO Corporation, and the victims. It also includes suggested readings and the following materials: 1. H.O.T Analysis of Industrial Accidents Applied to Bhopal Gas Leak, 2. Stakeholder Orientations in Industrial Disasters Tables, 3. Stakeholder Effects and Response Tables, 4. Comparison of Features of MIC plants in West Virginia and Bhopal, and 5. a student exercise: Identifying Responsibilities.


Appendix D: Union Carbide Corporation (233 KB, pdf): Appendix D provides details on the Union Carbide Corporation including how the corporation is organized, what safety issues they were aware of at the Bhopal Plant (1982) and the West Virginia facility (1989).

Appendix E: Vapors in Chemical Processing (682 KB, pdf): Appendix E is designed specifically with scientists in mind. It addresses the toxicity of chemicals at the Bhopal Plant, the types of hazards in manufacturing and using industrial products, the types of hazards in product use and consumption, and outlines notes on making the chemical H2V.

Appendix F: Assessing Responsibility: The Legal/Regulatory System (319 KB, pdf): Appendix F examines the policy changes and litigation resulting from Bhopal disaster. It includes a Note on Indian Supreme Court decisions regarding the Bhopal disaster, Western European and United States policy information about chemical plant hazards, and links to several relevant Supreme Court decisions.

Appendix G: Assessing Responsibility: The Engineers and Scientists (220 KB, pdf): Appendix G uses excerpts from legal proceedings to create “Contrasting Views of Responsibility for the Bhopal Disaster” and to assess the levels of responsibility for engineers and scientists involved in the UCC and Bhopal Plant.

Appendix H: Assessing Responsibility: Technical Expertise and Managers (200 KB, pdf): Appendix H uses IEEE and ASME Codes of Ethics to assess what levels of responsibility professional associations of managers have. The essay “Engineers and Managers” by M.J. Petersen explains what options managers have when faced with an ethical dilemma.
Dual Track Conceptual Framework

- These educational materials are organized along two tracks:
- Track 1 -- the impact of globalization on the work practices of scientists and engineers in their various work sites and
- Track 2 -- the impact of international-level regulatory processes on national regulations concerning scientific and engineering knowledge and applications.
- The first affects the ethics of professional conduct while the second addresses ethical participation in regulatory processes globally.
Track 1. Impact of Globalization on Work Practices

Module 1.1 Workplace Ethics in Transnational Contexts
- Transnational aspects and applications of professional codes of ethics
- Accountability in terms of innovation, self-regulation, scientific unions, corporate pressures, public and private standards, and corporation-specific campaigns and social movements

Module 1.2 International Accountability
- Processes by which behaviors, ideas and debates diffuse across countries

Module 1.3a Transnational Diffusion of Ideas and Practices

Module 1.3b Transnational Conduct
- Examines the problems associated with political censorship and other efforts to control access to basic science information
Track 2. Impact of International Regulatory Processes on National-level Regulations

Module 2.1 Variation in International Regulatory Processes

Examines variation in multilateral intergovernmental organizations such as United Nations Conferences, United Nations specialized agencies, regional conferences or commissions, and other international bodies including private industry standards-setting bodies.

Module 2.2 Responsible Participation

Vehicles for participation: epistemic communities, professional associations, scientists as citizen-advocates, scientists as employees of private organizations, and scientists as government officials. Examines various channels of influence open to each type of participation.

Module 2.3a Ethical Conflict Between Nations

Developing effective international level regulatory responses, particularly when national ethical preferences collide.

Module 2.3b Stakeholder Inclusion

Define and identify stakeholders in various contexts and explain a model of social mobilization.

Module 2.4 Social Equity

Examines international-level mechanisms for raising social equity concerns including global multilateral organizations, regional multilateral organizations, transnational policy advocacy, transnational social mobilizations, and elite knowledge and technical exchanges.
IDEESE – International Case Studies

- **Disciplinary Approaches**
  - Scientists and engineers face different types of ethical dilemmas that stem from fundamental differences in the nature of scientific investigation versus engineering.

- **Relevance Matters**
  - Students are more engaged when they discuss materials focused on situations they imagine facing themselves as their careers advance.
Links & Resources

- **ESENCE -- Digital Library Beta Site:**
  http://www.ethicslibrary.org/

- **International Dimensions of Ethics Education:**
  www.umass.edu/sts/ethics

- **National Center for Digital Government:** ncdg.org

- **Science, Technology and Society Initiative:** umass.edu/sts

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