ASEE and Bogazici University
Global Colloquium on Engineering Education

Engineering Ethics

frank j navran
www.navran associates.com

Introduction

❖ Ethics credentials
  ❖ 35 years in the field
  ❖ 5 books, 100+ articles, 200+ clients
  ❖ 20 Countries - five continents
❖ Engineering credentials
  ❖ Entered UConn College of Engr'g 1965
    ❖ Strong conceptual skills
    ❖ Weak math skills
    ❖ Shift to Political Science and Anthropology

Brief Job History

- 1969 - 1972 - Bell Labs
  - Premier research and development lab thru '84
    - 6 Nobel prizes
    - '39 speech synthesis
    - '47 transistor
    - '58 laser
    - '62 Telstar - 1st telecom/data satellite (still active)
  - My opportunity - research into how technology can be used to enhance adult learning
    - '71 Distance learning - 1 teacher - 12 locations
    - '71 Information processing rate of the brain
    - '72 Computer-based learning - (PDP8 tty35)
    - '72 Teaching skills for technical experts

Today's Question

❖ What does it mean to be an ethical engineer?

   ❖ ODOT case study

   ❖ Engineering ethics standards

   ❖ The challenge of ethical leadership

   ❖ Teaching engineering ethics

Case: Oregon Dept of Transportation

- ❖ Child killed at a crosswalk
  - ❖ Intersection of a State Highway and County Road
  - ❖ Town grief-stricken and outraged
- ❖ Legislature demands a traffic light
- ❖ Opinion of the ODOT engineer
  - ❖ A light is "bad" engineering
    - ❖ A placebo
    - ❖ Will not prevent future tragedies
    - ❖ Creates a false sense of security

J. Doe, PhD, PE

- ❖ The hero of our story is the lead engineer
- ❖ Doe's position…
  - ❖ I am a professional engineer (PE)
  - ❖ In part, I was hired exactly because I have that qualification
  - ❖ As a professional I am held to the standards outlined in the NSPE's Professional Code of Conduct
  - ❖ The Code restricts me from knowingly engaging in "bad" engineering

NSPE's Ethical Canons

Engineers will:

1. Hold paramount the safety, health, and welfare of the public.
2. Perform services only in areas of their competence.
3. Issue public statements only in an objective and truthful manner.
4. Act for each employer or client as faithful agents or trustees.
5. Avoid deceptive acts.
6. Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

Is That Ethical?

**Professional
Standards**

**Law and
Regulation**

**Policy and
Procedure**

**Organizational
Values**

**Operational
Norms**

**Personal
Values**

Challenge of Ethical Leadership

- ❖ Is there more to being an ethical engineer than ensuring one's engineering decisions "do no harm"?
- ❖ Engineers are also leaders - and leadership has ethical obligations as well?
  - ❖ What is an ethical leader?
    - ❖ One who can influence others to do what is right, fair, good and just, and …
    - ❖ For them to do so willingly and enthusiastically
  - ❖ Engineers/leaders shape organizational culture
    - ❖ Creating expectations
    - ❖ Define "How things really work around here"

Creating Expectations

❖ The challenge is to help create and/or sustain an organizational culture where decisions and actions conform to:

  ❖ Societal and legal standards of what is "right, good and just"

  ❖ Organizational standards of "how we do things around here" (formal and informal policies and procedures)

  ❖ Ethical cannons of the profession

Engineers as Shapers of Culture

❖ How culture is shaped and sustained
  ❖ Stated position or standard
  ❖ Formal systems
  ❖ Informal systems
  ❖ Measures and rewards
  ❖ Communication and education
  ❖ Response to critical events
  ❖ Perception's of leadership agenda / motives

Professional ethics starts in school

- ❖ Business Schools (AACSB) got it half right
- ❖ The debate (post-Enron) in business schools focused on adding ethics to the curriculum:
  - A. A "stand alone" ethics course, vs
  - B. Ethics distributed across disciplines
    - ❖ Management ethics
    - ❖ Finance ethics
    - ❖ Leadership ethics
    - ❖ Marketing ethics….
- ❖ AACSB opted for "B"

Rationale for B

❖ Concerns regarding
- ❖ Impact of adding another required course on recruitment
- ❖ Costs of retaining additional faculty
- ❖ Perception that "ethics is common sense" and therefore anyone can teach it
- ❖ Adding an ethics course might imply prior deficiencies that would impact their reputation

Ideal

- ❖ Stand alone ethics course to master the fundamentals, and
- ❖ Distributed ethics in <u>every</u> course for the opportunity to apply the fundamentals in a variety of situations
- ❖ E.g., vector analysis (UConn 1965)
    - ❖ Calculus 101
    - ❖ Physics 101
    - ❖ Chemistry 101
    - ❖ Engineering Drawing 101
- ❖ Aviation ground school 1969
    - ❖ Navigation in a three dimensional fluid

AACSB missed the bigger picture

- In my opinion AACSB defined the question too narrowly by limiting it to curriculum
  - Consider their role as ethical employers
    - E.g., meeting the "organizational" standards of FSGO, SOX, etc.?
  - Consider their role as an instrument of an ethical society
    - E.g., applying the same ethical standards to other institutional activities such as sport

American Society for Engineering Education

- ❖ Because engineering has a large and growing impact on society, engineers must be equipped by their education to fulfill their ethical obligations to the public at large, to their profession, and to their clients and employers.
- ❖ Ethics education in engineering should endeavor to equip students with the skills to confront ethical problems and exercise their ethical responsibilities as engineers.
- ❖ While ethical issues can be raised in a lecture format, students also need practice solving ethical problems first-hand.
- ❖ New engineering graduates need <u>substantial training</u> in recognizing and solving ethical problems.

Integral Ethics

- ❖ Engineering ethics should instill the recognition that engineering ethics is not a "sidebar" or afterthought
- ❖ There are to be two parts to every engineering decision
  - ❖ Does my technical solution address the technical challenge?
  - ❖ Is my technical solution consistent with the canons of my profession?

Lesson from grade four

- Show me your work
- If… we require our students to address the ethical components of every technical issue they address in our classes
- Then… we are creating the expectation that ethics needs to be considered every time we are acting in our capacity as an engineer
  - We meet OUR professional obligation as teachers
  - We instilled a valuable habit that will carry over after graduation

Dr. Doe got It right

- Integrated the objectivity of engineering with the subjectivity of ethical reasoning
- Sought a solution that provided both
  - The best technical response, and
  - The most ethical response
- Recognized that ethics is an integral aspect of every professional decision we make

Recap

- Engineering and teaching are both professions
- There are certain expectations regarding how we must behave in both roles
- Those expectations include our technical and ethical competence
  - If we do not consider the ethical component of engineering decisions we fail as engineers
  - If we do not teach the ethical component of the engineering curriculum we fail as teachers