

# Engineering Ethics: Teaching and Assessing

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# Motivation: ABET - Ethics will be more important!

- Current Criterion 3:

- (f) an understanding of professional and ethical responsibility

- Plus:

- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

- (j) a knowledge of contemporary issues

- Proposed Criterion 3:

- (5) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts

# Implies: acquiring three skills:

- *Recognize* potential ethical dilemma in the workplace
- Make informed *engineering judgments*
- Consider the long term *consequences* of engineering decisions in societal contexts

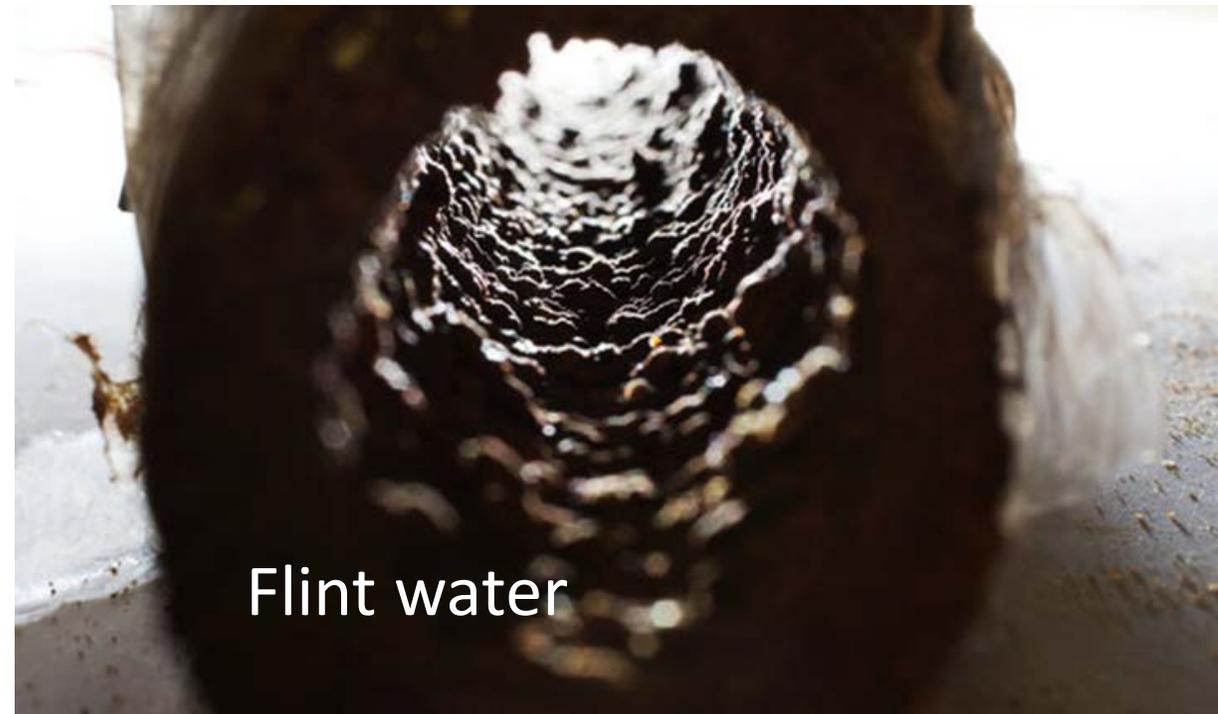


Stated another way - develop the ability to:

- Recognize a potential ethical dilemma
- Evaluate the risk
- Resolve the situation (without becoming a whistle blower)

# How to achieve?

- Cases – read, watch and review
- Discuss
- Reflect (written)
- Discuss again
- Reflect some more!



# Classroom Alternatives

- Seminars and guest speakers
- PBL – with embedded ethical scenario
  - Model Eliciting Activities (E-MEAs)
- Modules in engineering courses
- A philosophy course
- An engineering ethics course

# What are the barriers?

- Competent, qualified instructors
- Pedagogy
- Class size
- Faculty and administrator buy-in (especially department chairs)
- Assessment – how far can we move the needle?

## Faculty workshop – using E-MEAs



# So what do we do?

- Good:
  - Elective: Balancing Cost, Schedule and Risk (3 credits)
  - Required BioE: Societal, Political and Ethical Issues in Biotechnology (3 credits)
  - Required: Chemical Engineering Safety and Ethics (2 credits)
  - Various courses: E-MEAs and other realistic, posed problems
  - Capstone design
- Bad:
  - PHIL 300: Introduction to Ethics (if the only course)
- Ugly:
  - Presentation in undergrad seminar



# Assessing Cases: Analytic Rubric (Five Factors)

- **Recognition of Dilemma:** Ranged from not seeing a problem to clearly identifying and framing the key dilemmas. Clarification introduced to distinguish a problem from a dilemma; i.e., problems have coincident alternatives, dilemmas have opposing alternatives that must be reconciled.
- **Information:** At the lowest level, respondents ignored pertinent facts or used misinformation. At the high end respondents made and justified assumptions, sometimes bringing in information from their own experiences.

# Analytic Rubric

- **Analysis:** Lowest level respondents provided no analysis. Ideally, thorough analysis would include citations of analogous cases with consideration of risk elements with respect to each alternative.
- **Perspective:** Lowest level -none; i.e., focus wandered. Ideal is a global view of the situation; considering the perspectives of the employer, profession, society, etc.
- **Resolution:** Base level cited rules, even if used out of context. The ideal case considered potential risk and/or public safety, and proposed a creative middle ground (“win-win” situation).

# Rubric – Part of the Analysis Component (Five Levels)

Level 1	Level 3	Level 5
No analysis provided	Applies rules or standards with justification	Correctly applies ethical constructs
Defaults to an authority without further elaboration	Correctly recognizes applicability of ethical concept(s).	May offer more than one alternative resolution
Takes a definitive position without justification	Recognizes that contexts of concepts must be specified.	Cites analogous cases with appropriate rationale
Analysis done without reference to guidelines, rules or authority	Coherent approach	Explores context of concepts . . . . <i>more</i>

# An e-mail to me - April 2016

I wanted to send you a brief email saying thank you and that I appreciate everything that came out of my one semester course with you as an undergrad at Pitt during the class “Cost, Schedule, Risk: Engineering Ethics”. I just had this moment of realization, as I was updating my to do list at work; which included the following items, a request for me to do a cost breakdown so a more granular review of this proposal’s cost can be performed to see where cost can be reduced, a request to update the Risk Register and review if items can be removed or decreased, and lastly a request to meet with the proposal scheduler to see where efficiencies can be gained to reduce the schedule or get this subsystem off of the critical path...

# And the writer concluded:

As I was writing out this list and realizing how the three tasks are at odds with one another and wondering how this wasn't being understood (or understood and ignored) **I remembered sitting in that class with you and talking over these issues repeatedly and reviewing case studies.** That course was one of the better experiences I had during my curriculum and one that I feel I continue to get more from as I move along my career.

- B.S. Computer Engineering, 2009

Thank you!

