Special Session – Engineering Ethics: Toward a Definition

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Abstract – This special session addresses a challenge posed by engineering ethics: What does it mean? Review of the literature shows many competing definitions, each with their own understandings of the term ethics and the role it plays in engineering. Our aim is to review the different uses of the term “engineering ethics,” along with several other common terms, such as “professional ethics” and “professional responsibility,” and consider what might constitute clearer and more meaningful ways of understanding engineering ethics. As an interdisciplinary field, engineering ethics must represent both of its major parts: engineering and ethics. Examples of engineering ethics in the literature do not always make clear what aspects of ethics—a very large and complex field of philosophy—is being employed in an engineering context. Group activity and discussion will instigate a debate on how we should understand these terms and how we can be better about clarifying the key features of engineering ethics and its role in engineering education.

Index Terms – engineering ethics, professional responsibility, professional ethics, assessment

GOALS OF THE SESSION

The primary goal of this special session is to challenge the way engineering educators understand what we mean by the term “ethics” and its role in engineering education. The session aims to be practical as well as theoretical and stimulate a conversation about how best to develop and assess ethics in engineering curricula. Participants will have a chance to contribute ideas and feedback to the discussion which will provide useful information to the facilitators as well as the participants for how we all, as educators and professionals, can improve our teaching and assessing in engineering ethics.

DESCRIPTION OF SESSION CONTENT

“Engineering ethics” is a term often used and seldom fully understood. The confusion is likely due to the common reference made by engineers to the engineering “codes of ethics” to which each of the many disciplines subscribe. Codes of ethics, despite their names, often say very little, if anything at all, about what the term “ethics” means in this context. Many codes appear as abstracted descriptions of the ideal engineer, a fictional character who is rarely seen in the real world. The codes are useful guides for behavior for an engineer who never gets into a complicated situation where specific help is required or a situation where the codes might conflict with each other or otherwise fail to offer practical advice at the time. Many codes of ethics, then, are less ethical frameworks than they are descriptions of the “rules of practice” that all engineers must follow if they want to be part of the profession in good standing. Were an engineer to follow these codes precisely, there would still be much room for ethical uncertainty in the course of practicing engineering, meaning there would still be a need for proper philosophical ethical reasoning skills. In these situations students must be active moral agents who are able to analyze complex social phenomena, reduce the glut of information to only the pertinent items, recognize that there are ethical issues in the situation, and engage in a process of ethical reasoning that produces a justifiable course of action. The ability to employ such skills represents a higher level of moral development versus simply following the rules as described in the codes of ethics.

The session will engage participants in discussion on the role of ethics in undergraduate engineering education and practice, with special consideration for how ethics is currently taught and assessed. The facilitators will focus on recent and common examples. For example, the film and accompanying material titled Henry’s Daughters[1] is often presented as if it presents multiple ethical violations when its transgressions, when present, often present only potential ethical wrongdoing or present only the most benign form of wrongdoing: rule-breaking. Other common examples include post-mortem analyses of engineering “disasters” such as the Challenger explosion and the Kansas City Hyatt walkway collapse. However, these analyses often focus on the technical mistakes, miscalculations, and other non-ethical causes.

Participants in the session will have the chance to discuss what we mean when we use the term “ethics” in an engineering context and how that might differ from other uses of the term. We will address some of the common confusions and misunderstandings of the meaning of ethics in engineering, drawing particular distinction through the use of our examples between the notions of philosophical ethics and the professional responsibilities of practicing engineers. The session will involve participants directly, asking them to honestly confront what we see as problematic issues in the teaching of engineering ethics, while also providing participants with useful tools, skills, ideas, and knowledge that can be transferred and applied in their own classrooms and learning environments.
Specifically, we will discuss tools in which to assess students’ knowledge and abilities related to “engineering ethics”. While several measures have been designed to assess general moral development, such as the Defining Issues Test (DIT) [2], they are often intended to address ethical situations in general, rather than addressing the peculiarities of handling ethical situations in engineering. To address this need we have begun work on developing a measurement instrument, the Ethical Reasoning Instrument (ERI) [3], based on the successful structure of the DIT but tailored to the specific context of ethics within the engineering profession. The ERI is designed to follow the successful approach of the DIT of tying into Kohlberg’s stages of moral development.

**SESSION AGENDA**

5 mins  Introduction to format and goals of the session.

20 mins  Participants work in small groups to develop and discuss definitions and working understandings of “ethics.” Groups will also discuss understandings of “professional ethics” and ways in which that might differ from “professional responsibility” or from “ethics.”

15 min  Small groups report to the larger group and share their definitions. Small groups can share their ideas with one another.

20 mins  Participants discuss in small groups how we might teach ethics in an engineering context. Groups will create lists of teaching activities and methodologies for teaching within this context. Facilitators will challenge participants to identify methods of assessing learning in their proposed pedagogical environments.

15 min  Small group report out and large group discussion is facilitated.

10 mins  Facilitators will present their Ethical Reasoning Instrument (ERI) as an assessment tool designed for this task.

5 mins  Closure

**ANTICIPATED AUDIENCE**

The session is designed to reach educators and researchers who are concerned with teaching and measuring ethics in an engineering context.

**EXPECTED OUTCOMES**

The activities of this session are explicitly intended to motivate and guide future work in ethics education, specifically the development or revision of teaching materials and assessment methods. This discussion will pave the way for additional research opportunities aimed at studying ethics in engineering, from the ways students learn ethics in the classroom, to the way they apply their ethics skills in practice. The ideas generated by the session participants will inform our own understanding of engineering ethics and will develop networks of relationships for future collaborative research opportunities.

**JUSTIFICATION OF SPECIAL SESSION**

Ethics in engineering education is too often limited to reading the codes of ethics and considering whether a design is safe. In today’s global professional environment, engineers must develop an awareness of the social and cultural issues in which their work will be situated in addition to their technical engineering skills. Moving undergraduate curricular approaches toward a broader view is a challenge and this session will provide a forum for active discussion and for participation of engineering educators on this topic.

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**REFERENCES**

