Web-Based Education in Science and Engineering Ethics – Topic and Technology Barriers

Commentary on “Ways of Thinking about and Teaching Ethical Problem Solving: Microethics and Macroethics in Engineering” (J. R. Herkert)

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Joseph Herkert indicates that most web-based engineering ethics instruction, as well as general engineering ethics education, focuses primarily on microethics as opposed to macroethics. In doing so, engineering students are not adequately exposed to more global engineering societal concerns such as social responsibility, sustainable development and product liability.

What is the source of this problem? Is the lack of macroethics instruction due to the subject matter (the topic) or the medium of delivery (the technology)? Herkert infers that both are problematic, and that more formal training and collaboration is needed between engineers, ethicists, and science, technology and society (STS) scholars. In addition, this training and collaboration should emphasize ethical decision making in broader societal contexts, as well as training in the use of online pedagogical resources.

Subject matter barriers. As Herkert indicates, one problem with including macroethics in engineering ethics instruction is the paucity of detailed macroethics in engineering ethics textbooks, especially those at the undergraduate level of instruction. However, there has been an increasing trend to include such topics in graduate level texts. Moreover, one can work around this problem by creating a custom textbook as well as posting papers online. Such a text can be created using the latest McGraw-Hill custom publishing tools (Primis program) which allow instructors to assemble their texts from a variety of resources, and also to include their own material. Such a text might be primarily based on Schinzinger and Martin’s Engineering Ethics text, augmented with other readings from STS, philosophy, and sociology. This particular approach is appealing because it allows instructors to tailor texts to their subject matter, which is critical for an interdisciplinary field such as engineering ethics.

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While inadequate teaching resources such as textbooks can partially explain the gap in macroethics instruction, the cultural barrier to such instruction is likely more significant. Many institutions embed ethics training in other classes, and there is precious little time for basic engineering ethics instruction such as codes and conflicts of interest, much less more nuanced macroethics topics. Ideally, a two-semester engineering ethics course could be offered such that students are exposed to both micro- and macroethics. However, given current funding and faculty resource constraints in addition to limits on total student credit hours, this would be a tough sell at most large engineering schools. One exemplary exception is the University of Virginia, School of Engineering and Applied Sciences which requires that all students attend such a two-semester class sequence.

**Technology barriers.** In a distance learning environment, it is often difficult to provide instruction for topics such as risk and product liability, sustainable development, globalization, healthcare, and information technology. A key component in macroethical lectures is the ability for students and faculty to engage in dialogue, as this component of both voicing and listening to opinions is central to active learning. In web-based engineering ethics instruction, the discussion component of learning can take on two forms, synchronous and asynchronous. Unfortunately, real-time “chat” technology included in many web-based instructional software packages can be unwieldy and difficult to manage, so often asynchronous discussions fill the gap. While not an ideal discussion setting, asynchronous discussion can provide a forum for idea exchange, and students who are too timid to speak up in class may have fewer inhibitions through posting responses. Often discussions online are more provocative since the computer provides a sense of social distancing. For example, in one online discussion, students were asked to discuss whether it was ethical for engineers to design weapons, a question that links both macro- and microethical issues. The following is an excerpt from a discussion thread:

*I do not believe that the engineers are responsible for suffering caused by a war...Having better weapons than the enemy will assure that fewer American lives are lost. While the engineer cannot alter the state of global politics, he can at least assure that minimal losses are incurred on the home population.*

*Many technological developments were usually triggered by military reasons. So engineers are the ones to blame. I strongly believe that engineers are as responsible for suffering of innocent lives as the ones who are using [the weapons]. An engineer shouldn’t feel it is ethical because he is not the one who is using [them].*

The asynchronous forum can provide many of the same benefits that in-class discussions provide such as exposure to others’ ideas (which are arguably less restrained) as well as the formulation of an argument to defend one’s position. In terms of my online engineering ethics class, the asynchronous discussion component was the students’ favorite.