Engineering education may diminish concern for public welfare issues

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Collegiate engineering education may foster a "culture of disengagement" regarding issues of public welfare, according to new research by a sociologist at Rice University.

For the first-of-its-kind study, the researcher used survey data from four U.S. colleges to examine how students' public-welfare beliefs change during their college engineering education and whether the curricular emphases of their engineering programs are related to students' beliefs about public welfare. The study found that engineering students leave college less concerned about public welfare than when they entered.

Study author Erin Cech, an assistant professor of sociology who has B.S. degrees in both electrical engineering and sociology, said that many people inside and outside engineering have emphasized the importance of training ethical, socially conscious engineers, but she wonders if engineering education in the U.S. actually encourages young engineers to take seriously their professional responsibility to public welfare.

"There's an overarching assumption that professional engineering education results in individuals who have a deeper understanding of the public welfare concerns of their profession," Cech said. "My study found that this is not necessarily the case for the engineering students in my sample."

Cech said that as part of their education, engineering students learn the profession's code of ethics, which includes taking seriously the safety,

health and welfare of the public. However, she said, it appears that there is something about engineering education that results in students becoming more cynical and less concerned with public policy and social engagement issues.

"The way many people think about the engineering profession as separate from social, political and emotional realms is not an accurate assessment," Cech said. "People have emotional and social reactions to engineered products all the time, and those products shape people's lives in deep ways; so it stands to reason that it is important for engineers to be conscious of broader ethical and social issues related to technology."

Cech said that this "culture of disengagement" is rooted in how engineering education frames engineering problem-solving.

"Issues that are nontechnical in nature are often perceived as irrelevant to the problem-solving process," Cech said. "There seems to be very little time or space in engineering curricula for nontechnical conversations about how particular designs may reproduce inequality – for example, debating whether to make a computer faster, more technologically savvy and expensive versus making it less sophisticated and more accessible for customers."

Cech said ignoring these issues does a disservice to students because practicing engineers are required to address social welfare concerns on a regular basis, even if it involves a conflict of interest or whistleblowing.

"If students are not prepared to think through these issues of public welfare, then we might say they are not fully prepared to enter the engineering practice," Cech said.

Cech became interested in this research topic as an undergraduate electrical engineering student.

"Because I went through engineering education myself, I care deeply about this topic," she said. "I want to advance the conversation about how engineering education can be the best it can possibly be."

The study included more than 300 students who entered engineering programs as freshmen in 2003 at four U.S. universities in the Northeast. Rice students were not included in the study. Participants were surveyed in the spring of each year and at 18 months after graduation. In the surveys, students were asked to rate the importance of professional and ethical responsibilities and their individual views on the importance of improving society, being active in their community, promoting racial understanding and helping others in need. In addition, the students were asked how important the following factors are to their engineering programs: ethical and/or social issues, policy implications of engineering, and broad education in humanities and social sciences.

"Culture of Disengagement in Engineering Education?" will appear in an upcoming issue of the journal *Science, Technology and Human Values*. The research was funded by the National Science Foundation.

Provided by Rice University