

COVID-19 Pandemic Reveals a Major Challenge in Engineering Ethics Education

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Luan M. Nguyen is an MA/Ph.D. student in Anthropology/Civil Engineering, who completed his Master of Science in Biochemistry at Iowa State University and his Bachelor of Science in Chemistry at Hartwick College. His first master's thesis focused on the structural analysis of the schizophrenic gene DISC1 using transmission electron microscopy and hydrogen-deuterium exchange mass spectrometry. For his second master's thesis, he focuses on identifying the individual and institutional factors that contribute to a "culture of disengagement" from the ethical dimension of engineering work among students in the engineering profession. His Ph.D. project is funded by the NSF and is concerned with promoting and improving engineering students' ethical behavior and sensitivity through on-campus student organizations. His academic interests include mental health, international development, human rights, and engineering ethics. Currently, his ambition is to work within an international organization such as UNESCO and to be an advocate for promoting science and technology as critical tools of sustainable development as well as to participate in the dialogue between scientists, policy-makers, and society. Luan enjoys traveling, reading, and watching documentaries.

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Dr. Kasey Faust is an Assistant Professor in Civil, Architectural and Environmental Engineering at the University of Texas at Austin. Her research on sociotechnical systems—primarily water sector infrastructure—aims to improve service to communities. Dr. Faust's work spans the project phase during construction through the operations phase, exploring human-infrastructure interactions, infrastructure interdependencies, and the institutional environment. Current studies within her research group include: human-water sector infrastructure interdependencies in cities experiencing urban decline; disaster migration and the resilience of the built environment; incorporating equity into water infrastructure decision-making; sociotechnical modeling of infrastructure systems including gentrification and food deserts; the impact of policies and regulations on the built environment; understanding the impact of institutional elements on projects; and modeling of public perceptions.

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Dr. Kate Padgett Walsh is an Associate Professor of Philosophy at Iowa State University. She received a B.A. from Middlebury College, an M.A. from the University of Wisconsin-Milwaukee, and a Ph.D. from Northwestern University. Her research focuses on ethics and the history of ethics, including the ethics of debt and finance, as well as the scholarship of teaching and learning.

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Dr. Scott Feinstein is an expert in research design and comparative and identity politics.

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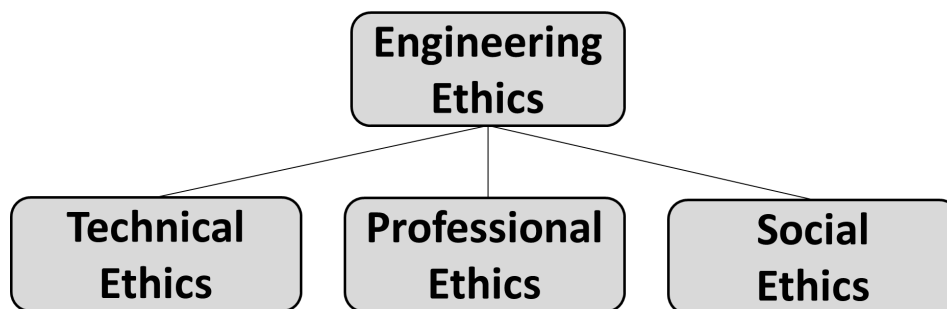
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Summary of Work

The COVID-19 pandemic has caused devastating impacts on our society, exacerbating human suffering and upending thousands of lives. However, it is not solely a health crisis; in fact, it is a “human, economic, and social crisis” [1] that requires combined efforts spanning disciplines to solve emerging social problems. Engineers, with their technical knowledge, are extremely helpful in addressing these social problems exacerbated by this pandemic such as racial discrimination and socioeconomic inequalities. An engineer driven by both technical knowledge and considerations of social/political impact will be much more productive in developing long-lasting solutions.

Figure 1: the three major types of ethics within engineering ethics.



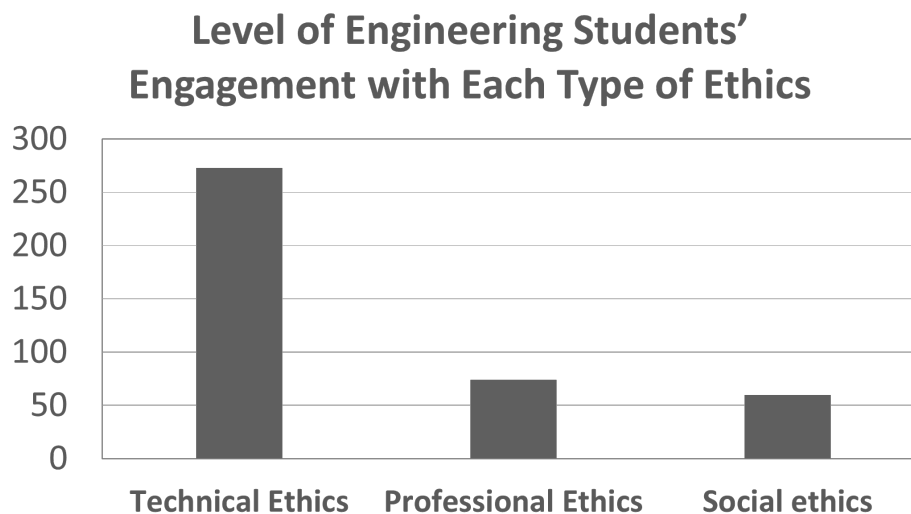
Previous work has found that the U.S. engineering education does not heavily focus on teaching students their professional responsibility to public welfare due to the presence of a culture of disengagement [2]. Here, disengagement refers to the tendency to not consider a variety of social concerns, such as socioeconomic inequality, history, and global politics, in the design or implementation of technological objects and systems [2]. We suggest that, within a culture of disengagement, students primarily engage with technical microethics and professional ethics; that is, they engage less with social ethics (Figure 1). We propose a theoretical framework based on the micro-macroethical framework by Herkert (2001) that engineering ethics consists of technical, professional, and social ethics [3]. We suggest that the focus of technical ethics, which is the ethics of making technical decisions in engineering, is on the design of the product, process, or system under consideration, but not on the wider societal issues created or amplified

by technical decisions. The focus of professional ethics, which is directed toward the interactions between cooperating or competing individuals and groups in a community, is on how members of the engineering profession relate to specific others as part of their work, but not on the wider societal issues created or amplified by professional decisions. Social ethics, which is directed toward identifying and responding to the social and political implications of engineering projects, focuses on the wider societal impacts of the technical and professional decisions made by engineers. The COVID-19 pandemic and the corresponding social problems that emerged represents an ongoing real world macroethical issue. We hypothesize that the culture of disengagement might be most apparent when engineering students are presented with such an issue. Here, we explore whether this culture persists even when students experience a real world ethical issue, such as the global COVID-19 pandemic, that directly affects their day-to-day lives.

We surveyed graduating engineering students' perception of their role as engineers during the COVID-19 pandemic in order to see whether the culture of disengagement manifests itself in the students' responses. From this survey, one question is of interest: *“What are some ways that engineers could address the COVID-19 pandemic? Please explain.”*

Here, we confirmed that the culture of disengagement manifests in students' responses, by showing that there is a lack of focus on social ethics in U.S. engineering education (**Figure 2**). These results align with the culture of disengagement in U.S. engineering education and a broader lack of engagement with ethical issues at the macro-societal levels.

Figure 2: Level of Engineering Students' engagement with each type of ethics



References

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- [3] J. Herkert, "Future directions in engineering ethics research: Microethics, macroethics and the role of professional societies," *Science and Engineering Ethics*, vol. 7, p. 403–414, 2001.