

A Framework For Applying Engineering Ethics To Contemporary Topics

ABET's EAC Student Outcome 4 requires engineering programs to demonstrate that students possess "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."^[1] While some curricula include a separate engineering ethics course, departments may also seek to integrate ethics content within existing core classes. This teaching tip describes an approach to addressing ethics within two lectures and includes an in-class activity, a written assignment, and an oral presentation assignment.

The Markkula Center for Applied Ethics presents six ethical frameworks that can be applied to analyze an ethical dilemma: (1) Rights, (2) Justice, (3) Utilitarian, (4) Common Good, (5) Virtue, and (6) Care.^[2] The Markkula Center website describes each framework and its application, and provides a useful scaffold for ethical decision making. Additionally, the site shares a wealth of ethics resources, spotlights on contemporary issues framed in an ethical setting, and case studies.

Within the context of a required junior-level 1-credit Professional Development Seminar course that meets weekly for 50 minutes, I spend two lectures on this material – one period covering the ethical lenses and frameworks for ethical decision making and a second period that includes an interactive class discussion where students practice applying these lenses. For example, students may be divided into two groups and asked to assume the role of either a development company or concerned citizens at a Town Council meeting to discuss, using the ethical lenses, whether to allow fracking in a small rural community. A more recent example during the COVID-19 pandemic was for students to make a case, using the ethical frameworks, for which group should be given priority for the COVID vaccine: medical providers, those over age 65, teachers, prisoners, non-medical essential workers, or those in under-resourced communities. Another discussion prompt might include the scenario of a student who accepts a full-time position in the fall, then continues interviewing and eventually reneges on their acceptance for a position that pays more. Through this discussion process, students become more adept at using the ethical frameworks to support their arguments. While the COVID and job acceptance examples do not explicitly address engineering topics as defined by ABET, students get valuable practice in applying the frameworks to familiar scenarios in preparation for the formal assignments.

A written assignment asks students to identify and examine a current, real-world controversy involving some combination of science or engineering with public policy, law, public health, medicine, environment, and members of the public (as individuals or groups). This topic should relate to a current event or issue in the student's home state or region. Students are encouraged to search newspapers, magazines, ethics newsletters, ethics/science journals and blogs to get ideas for a relevant topic.

The students are asked to:

1. Briefly summarize the technology or issue (400-500 words)
2. Using and stating one (or more) of the ethical frameworks, analyze the ethical aspects of the issue or technology to support an argument on one side of the issue in an effective executive summary (400-500 words)
3. Using and stating one (or more) of the ethical frameworks, analyze the ethical aspects of the issue or technology to support an argument on the opposite side of the issue (i.e., *against* their previous argument) in an effective executive summary (400-500 words)

As a follow-up assignment, students are asked to use the same engineering ethics topic from the written assignment as the basis for a 10-minute oral presentation with a 3-minute Q&A period. In addition to presenting content from the written assignment, students are also asked to provide their personal opinion on the issue during the presentation.

This course is typically taught in three sections of 25 students each. While the small class size lends itself well to group discussion, the activities could also be scaled up while still including the active learning components. There is a detailed rubric for both the written document and the oral presentation (available from the author at lgbullar@ncsu.edu). Students receive credit for class attendance, but their participation during discussion is not assessed. Oral presentations are scheduled outside of class time (class is cancelled for that week), and students must attend two presentations other than their own.

The combination of in-class discussion, a written assignment, and an oral presentation assignment provides students with multiple opportunities to practice and obtain feedback in applying the ethical frameworks and explaining their ethical rationale for a particular position.

REFERENCES

1. ABET, <https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2022-2023/>, accessed June 13, 2022.
2. Markkula Center for Applied Ethics, <https://www.scu.edu/ethics/ethics-resources/a-framework-for-ethical-decision-making/>, accessed June 13, 2022. □

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