

## Steve Starrett: EESE Course Portfolio

Summary: A civil engineering professor used case studies to give graduate students practice in critiquing ethical scenarios and to provide students with a decision-making framework they can use throughout their careers.

### Level 1 Background

CE 790 is an engineering ethics course for graduate students. To help prepare students for the inevitable ethical dilemmas they will confront as professional engineers, this course was entirely devoted to analyzing real-life case studies. My goal was to give students training and practice in critiquing ethical scenarios, as well as to provide them with a systematic ethical decision-making framework they can use for the rest of their careers.

### Level 1 Implementation

As an online course, all interaction occurred via the Internet. I first showed students a PowerPoint presentation to give them background on ethical decision-making. I then provided students with 14 unique, real-life ethical scenarios and asked them to analyze them following a rubric I provided with the initial assignment.

### Level 1 Student Work

The repeated use of case analyses allowed students to master the skill of thoroughly analyzing ethical dilemmas. Student papers tended to improve from D- and C-level work to A-level work by the end of the semester.

### Level 1 Reflection

Next time I teach this course I'd like to find ways for students to interact with their classmates; the fact that students currently work independently and at their own pace makes this challenging. I also plan to adjust the rubric to better represent the characteristics of excellent performance; this would increase the alignment between the grade I assign and the rubric I give students to guide their work.

## BACKGROUND

I teach CE 790: Engineering Ethics. [[link to syllabus](#)] This three-hour course is entirely online and open to graduate engineering students, as well as some seniors. Most graduate students in the course work full-time and are long-distance. Six students were enrolled during the semester I document in this portfolio.

Practicing engineers are constantly faced with ethical dilemmas and are expected to adhere to the National Society of Professional Engineer's code of conduct. [[link to code of conduct](#)]. To prepare students for their professional careers, this course is totally

dedicated to students learning about engineering ethics, professional responsibility, and scientific integrity through the study of real dilemmas that have occurred. Students demonstrate their understanding through detailed analyses of each case. Some of the cases are highly publicized, and others are from individuals that I know personally. Each case is a unique and difficult situation. Consequently, I expect students to use about eight hours to investigate all aspects of the situation, explore the different perspectives of the parties involved, and determine what they would recommend to the various scientists or engineers making the decisions.

The educational goals of the course were to:

- Expose students to many different types of ethical dilemmas
- Improve understanding of responsibilities of engineering
- Improve ethical decision-making
- Promote well-thought-out ethical decisions

Specific case studies included bribery, data fabrication, data falsification, whistleblowing, dealing with people in position of power with huge egos, poor design-review process, and “plan-stamping” [[link to example case—Space Shuttle—here](#)].

## IMPLEMENTATION

I teach CE 790 as a distance course. Because this course is really an independent study course, there is no lecturing involved. However, in order to provide students the necessary background for completing their ethics case analyses, I have students watch a PowerPoint lecture at the beginning of the semester. [[link to power point](#)]. Beyond this introductory information, students are required to use library and Internet resources to help them analyze cases.

### Opportunities for students to demonstrate their understanding

Students intensively studied 14 cases [[link to sample cases](#)] and provided a formal report for each (approx. six to ten hrs of work per case). Most cases were based on real events and experiences described by professional engineers. For example, one case ([link to Hyatt Regency case](#)) describes a situation where the flawed design and construction of elevated walkways in a Kansas City hotel resulted in their collapse, killing 114 people. Another example ([link to Environmental engineer case](#)) describes an all-too-common scenario in which an environmental engineer collects data that condemns a client, but the engineering company hides the data in order to keep the client’s business.

Before giving students their first case, I provided them with a general outline [[link to outline](#)] of “how to tips” for conducting case analyses, as well as a detailed rubric. [[link to rubric](#)]. For each assignment, students were expected to address the three primary decision-making frameworks: utilitarian, rights and duties, and virtues-based.

Student submitted their assignments via email at their own pace. I discussed cases individually with students by email or by phone both before they were due (to address student questions), and after they were returned (to address reasons for assigning a given grade). The frequency of contact relied primarily on how much guidance the student requested and how well they were performing. In general, student requested less help as the semester progressed.

## STUDENT PERFORMANCE

I noticed marked improvement of the grades over time, as students got better at analyzing the cases. For example, one student improved from D-level work [[link to work](#)] for Case #1 [[link to case](#)], to B-level work in case #2 [[link to B-level work and case](#)], and eventually achieved A-level work by the end of the course [[link to A-level-1 work and](#)]. In the first case study, this student responded as many do: by expressing opinions about the case and its solution, but not thoroughly analyzing competing viewpoints or solutions. Moreover, in the first assignment this student—as with many others—did not provide an organizational framework following logically from a thorough description of the problem. By the end of the course, students demonstrated the capability to identify affected parties, propose and analyze solutions, and approach a problem from any of the three ethical decision-making approaches.

All students received an A as their final grade in the course. This is due, in part, to the repetitive nature of the assignments. I grade very critically initially, and students typically rise to the challenge of improving their ability to analyze ethical situations systematically and thoroughly. In a sense, this allows students to master the task of ethical analysis through practice, instructor feedback, then more practice.

## REFLECTIONS

Overall, the students really enjoyed gaining extensive knowledge about some landmark engineering disasters and the associated ethics. The students greatly improved their understanding of ethics, how ethical decisions are critically important to the field of engineering, and, importantly, also how to analyze ethical dilemmas and determine the best solution.

The primary student complaint I received about the course was that students felt analyzing 14 cases was too much work. I presume that students complained both because of the workload and because of the repetition involved with analyzing different cases using the same methods. Next time I teach the course, I will limit the number of case studies to 12.

Ethics cases are rarely black-and-white, and discussion with peers would likely be a productive way to spend time. Next time I teach the course, I would like to find ways for students to interact with one another. One possible avenue might be to incorporate discussion about the cases through chat rooms or online discussion boards. Currently, students rarely study the same case at the same time because they set their own pace; some organizational changes would be necessary to promote discussions of cases among peers.

Using the rubric as a guide for grading made me realize that there were aspects to high-level performance that I didn't initially include. For example, I think I would emphasize organization more than I currently do. In addition, I would emphasize the need to conduct additional web or library-based research to understand technical details of a case, or to find other ethical situations in which precedent has been set in our field to serve as a basis for comparison.

CLICKBACKS:

Syllabus: [Syllabus CE790.doc](#)

Code of conduct: [NSPE Code of Conduct.pdf](#)

Powerpoint lecture: [Ethical Situations Engineers May Face.ppt](#)

Case studies:

Outline: [General approaches case studies.doc](#)

Rubric: [rubric.doc](#)

Student work:

[D-level work.pdf](#)

[B-level work.doc](#)

[A-level work-1.pdf](#)

[A-level work-2.pdf](#)