AC 2010-1395: HOW TO TEACH AN ENGINEERING ETHICS COURSE WITH CASE STUDIES

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How to Teach an Engineering Ethics Course with Case Studies

Abstract

I believe it is fairly clear that case studies are useful for teaching engineering ethics. This is because case studies have a way to bring abstract concepts (philosophical ethics) into the practical realm: actual or made-up cases that involve engineers. But there are good ways to use case studies and then there are bad ways to use them. In this presentation, I hope to make some modest recommendations regarding what goes into using case studies properly. First, however, I will briefly address how an engineering ethics course that uses cases studies should be taught. I intend to discuss topics such as the need to cover philosophical ethics first, the use of non-engineering case studies, and the benefits of bringing in a philosopher to help with this portion of the course. Then I will make some suggestions regarding the way individual case studies should be used in class, addressing topics such as how to prepare for the use of a case study, how to present them case in class, what to discuss (and what not to), etc. By way of introduction to this presentation, I will use a humorous movie clip to illustrate how case studies sometimes go awry. My talk will be helpful to those who are currently teaching engineering ethics courses (as it may help them fine-tune the delivery of their cases studies) as well as those who are contemplating teaching such a course in the future (as it will provide them with a suggested format to put together their syllabus).

Introduction

Consider the following movie clip, where the main character, Brian, finds himself in a tight spot.

[Show 3-minute clip from Monty Python's "Life of Brian." In this clip, Brian falls—literally—into a situation where he has to preach to some bystanders. He starts telling a parable and his audience keeps interrupting him because they want more details (asking questions like "What kind of birds were they?" and "What were the servants' names?"). Brian is stumped: he is trying to make a moral point, yet cannot get to it because he is compelled to supply unnecessary details.]

What happened in this vignette? Brian finds himself having to tell a parable. "There was this man who had two servants," says Brian. Obviously he wants to tell a story to illustrate a moral point. "What were their names?" asks one of the bystanders listening to Brian. Brian in turn is confused by the question and waffles. What purpose would it serve to know the servants' names? "It doesn't matter," says Brian, "the point is…" and he is interrupted again: "What do you *mean* 'it doesn't matter'?" Brian never gets to the point of the story.

What is a parable but an early version of a case study? A case study is an example—drawn from history or from someone's imagination—that is used to illustrate a particular point or concept. In engineering ethics, for example, the DC-10 case is commonly used to make the case for the positive moral worth of whistle-blowing. Case studies can vary in complexity, from short and to the point (like the Monty Python clip) all the way up to the elaborate historical cases such as the Ford Pinto case, the BART case and the Challenger disaster case. There are also fictional case study videos, such as the recently-released *Henry's Daughters* and *Ethicana*, specifically tailored for engineering ethics classes, that merit special attention.[1] It makes sense to use case studies in applied ethics courses because they present instructors with a way to illustrate a theoretical concept (such as a moral principle) to an audience of soon-to-be professionals. But is it really as easy as it sounds? The author's contention is that using case studies, though perhaps the best method to teach applied ethics[2], is harder than meets the eye and that, in most cases, the mantra "less is more" will ring true.

Before making some modest suggestions regarding how case studies should be used in class, it will be necessary to digress a bit and say a few things about teaching applied ethics courses in general. It should also be made clear that the author has no formal assessment tools available to prove that these recommendations are effective. However, the author has taught philosophical ethics as well as applied ethics of a different sort, namely military ethics at the United States Air Force Academy, and his contention is that successes that he has personally experienced there can be obtained in the field of engineering ethics as well. Cleary, a careful assessment of these methods is in order and would be of great benefit to the field of engineering ethics (and of applied ethics in general).

Teaching Applied Ethics Courses

The author has dealt with this topic before[3], but a brief outline of one of the main arguments will be beneficial here. Applied ethics courses—of all flavors—need to strike a balance between teaching philosophical concepts (theory) and applying them to specific cases (practice). Such a balance between theory and practice, in turn, requires a careful handling of two types of knowledge, which Aristotle called *epistēmē*, meaning theoretical knowledge, and *phronēsis*, referring to practical knowledge.[4] Explaining the difference between Kant-style deontological ethics and Mill-style utilitarianism, for example, is the kind of material that feeds the student's *epistēmē*. Unfortunately, *phronēsis* is the kind of knowledge that, by definition, can't be taught (it takes lots of time and experience), but the use of case studies comes in handy because it taps into those bits of practical knowledge and real-world experiences that students have had—or at least can imagine.

Such *epistēmē*-building material (moral philosophy) should be covered first. That way, by the time the course progresses to specific engineering ethics cases, the conceptual framework has been erected and can receive the specifics of the case. Think about it in terms of hanging

wallpaper: the design on the wallpaper is the case study being discussed, but to make it adhere to the wall you need glue. A proper understanding of moral philosophy is that glue.

Major moral theories covered ought to include the usual suspects: virtue ethics (Aristotle and Alasdair MacIntyre), social contract theory (Hobbes), principle-based ethics (Kant, W. D. Ross and Rawls), and consequence-based ethics (Mill, Brandt and Singer). But this portion of the course should also cover meta-ethics topics such as relativism, pluralism, absolutism, natural law, divine command theory, as well as methods of analysis. This last topic, how to analyze moral dilemmas, is where casuistry comes in.

What is casuistry? The short answer is that casuistry is doing ethics by case studies, that is to say, trying to resolve an ethical problem at hand by appealing to similar "paradigm cases" (the term "casuistry" comes from the word "*casus*," which is Latin for "case"). Casuistry was introduced in the 16th century by the Jesuits and the story behind its heyday and its subsequent decline is well worth discussing in one or two class periods.[5]

Two brief recommendations here. First, the instructor might want to consider collaborating with the college or university's philosophy department during this first part of the course. Such interdisciplinary approach may increase the overall course's effectiveness because a subject matter expert in philosophical ethics would be teaching the first portion of the course.[6] Secondly, the instructor might think about using mostly non-engineering case studies and illustrations during this period. This would emphasize that moral philosophy applies to all aspects of life, but would also set things apart for the latter portion of the course where the particular focus is the applicability to the engineering profession. Here's an example of a clip that can be used to illustrate a very specific moral point.

[Show 2-minute clip from "Office Space." The main character, Peter, is talking with his girlfriend, Joanna, about a computer program he wrote that is unexpectedly lucrative. Peter takes a utilitarian view, arguing that the good consequences for him far outweigh the minor bad consequences for others. Joanna responds with principle-based reasoning, arguing that while the consequences might be significant, the program in questions essentially allows Peter to steal from others.]

As you can see, this clip clearly and concisely illustrates the tension between principle-based and consequence-based ethics. Notice that in this case a short clip (2-3 minutes) is sufficient to make the point. Some of what I have done to use this clip will serve as a basis for discussing the second portion of this presentation: using case studies in class.

How to Use Case Studies

Recommendations provided fall into two categories: on the one hand there is preparation and presentation (here the advice will be quite mechanical), and, on the other hand, we have suggestions for effective casuistic analysis.

Preparation and Presentation

For short illustrations, movie clips, etc., the faculty member is probably the only one who needs to prepare. Longer and more complicated cases, however, may require student preparation and in these cases prior planning is key. Give students ample notice regarding what they need to do (read a case, watch a movie, etc.), and in some cases it might be worthwhile providing them with a sense of what to focus on, what to expect, what to skim or skip, and so on. In both these cases (short and long case studies), the chief imperative is to select the cases carefully and ensure that there is a clearly discernable point to be made with each one. The two movie clips used earlier are good examples of this. The clip from *Office Space* honed in on a Kant-versus-Mill (deontological versus utilitarian) moral point, while the clip from *The Life of Brian* illustrated how sometimes people are compelled to get caught in details that are irrelevant to a moral story.

Strictly on the technical side of things, it is also important to have the audiovisual equipment and delivery methods worked out ahead of time. Test the equipment thoroughly and rehearse the delivery method. Smooth transitions are important as they cut down on distractions.

Case studies can be presented in the classroom or outside of class, depending on logistical considerations. For example, if using a full-length movie ("The Unforeseen," for instance, is great for a variety of environmental engineering topics), perhaps it is best to have students watch it ahead of time. If presenting the case in class, as mentioned earlier, it is important to have all the technical considerations worked out.

Casuistic Analysis

The first point to be made here is this: instructors should carefully weigh the amount of material presented in the case study against the amount of analysis and "practical-to-theoretical punch" expected to be gleamed from it. It is a common mistake to try to get too much from a case study, and, in the author's experience, the mistake is made when the instructor presents more case study details than what is needed to make the sought-for theoretical connection. Case studies, especially the long and complex ones, come riddled with a wide variety of details that are simply not relevant to the moral point to be made, yet we—as engineers or simply as people who like a good story—tend to gravitate towards and get mired in them.

This problem with casuistry was well known to the Jesuits. "Getting lost in the details" was, according to Jonsen and Toulmin,[5] one of the reasons casuistry started its decline (again, this is a fascinating story, but it exceeds our scope here). The solution sounds counterintuitive: "less is more." "Less" means that the instructor should try to reduce the amount of details regarding a case study to those variables that are actually relevant to the moral point sought. This is really the point of using case studies in the first place: instructors should know exactly what theoretical concept a particular case study is meant to illustrate and then show just enough material to arrive at it. "More," of course, refers to more—and hopefully deeper—understanding.

Don't get me wrong. Sometimes in order to get to a theoretical point it *is* necessary to go over some details in the case at hand. The DC-10 case is complex and in order to understand what Dan Applegate's moral obligations were it is necessary to go over some details, particularly regarding the nature of his position, his relationship with Convair and McDonnell-Douglas, etc.[7] Yet it is possible to do too much: exact dates, times, names, etc., may be irrelevant to the moral point being made and it is here that the instructor needs to exercise judgment. When students ask questions about details that are not morally relevant (similar to "What were the servants' names?"), the instructor's best answer may very well be a tactful "that's in interesting question, but perhaps you can clarify how the answer to that question might be morally relevant to the case at hand?"

When we discuss case studies properly we learn to identify all—or at least most—of the morally relevant factors: principles that govern the situation, short- and long-term consequences to a variety of parties, virtues that are praiseworthy as well as vices that are not, etc. And when we exercise this with case studies we hone our abilities to identify the same factors in situations we will later face in the profession. That is precisely why it is so important to get used to asking the right sorts of questions.

The questions posed during the discussion of a particular case should therefore be of the sort that tie things back to the first part of the course. For one thing, this would make clearer why covering philosophical ethics was important, but it would also help the discussion arrive at those deeper, more subtle ethical concepts more clearly and directly. For example, having covered Kant's duty-based ethics earlier in the semester, a case study discussion question might be, "What were character X's duties?" These questions can be assigned ahead of time, so that students are aware they should be looking for the answers while researching/viewing the case study, or they can be asked during the class discussion period.

Here, then, are a set of proposed discussion questions—applicable in just about any case study encountered—grouped by the moral theories and concepts that ought to be reinforced.

Aristotle's Virtue Ethics (character-based):

     - What sorts of virtues or vices were evident in the behaviors of the characters in the case?

     - Can you think of an example of a character following Aristotle's advice regarding the "golden mean"? Or perhaps one whose judgment displayed a clear violation of the mean?

Kant's Deontological Ethics (principle-based):

     - What may have been character X's maxims? Are these maxims universalizable? Why or why not?

- Where character Y's duties perfect or imperfect? Why does that distinction matter in this particular case?

Mill's Utilitarian Ethics (consequence-based):

- Did character X's decision really result in the greatest good for the greatest number?

- Did character Y's response appropriately balance short term and long term consequences?

- Mill discusses various notions/definitions of "justice" in the last chapter of *Utilitarianism*. When you consider character Z's choices, which of these notions seem(s) to apply? Who do they line up with your understanding of justice?

Relativism, Pluralism, and Absolutism:

- Character X offered character Y a bribe, but this situation happened in a foreign country where this sort of thing is more common. Is offering (and accepting) bribes in this case wrong?

- We have seen that character X's dilemma puts following principle A in direct conflict with consequence B. How do you resolve dilemmas of this nature?

This is how casuistic analysis works. The case study is deconstructed into its component moral features. A judgment can then be made regarding whether the actors, be them from real-life cases or fictional ones, acted morally. We need not be *judgmental* here: we can entertain questions about whether the circumstances made it difficult or impossible to have acted otherwise, too. The author's contention is that this is what makes case studies useful; that is to say, case studies show us how to analyze the morally salient aspects of paradigm cases, which in turn help us identify similar moral questions in situations and activities we will encounter in our own lives.

In his own career, the author has encountered examples of ethics instruction that involve the use of a so-called "ethical decision-making process."[8] Such a model essentially reduces moral decisions to an ethical polynomial of sorts. For reasons that go beyond the scope of this paper, the author maintains that this approach to teaching ethics is counterproductive. But a contrast can be made with casuistic analysis and point out that although comparing one's own moral dilemmas with paradigm cases is helpful (because we identify similar moral issues that may be common to both), casuistry does not function as a polynomial that gives us the "right answer" every time. This is because the circumstances of those paradigm cases always vary from that of our own, so we still have to exercise a degree of autonomous judgment to reach our moral decisions. And this, I suggest, is a more realistic way to approach solving complex moral dilemmas.

Conclusion

University and college departments such as law, health, business and engineering should continue to offer their respective applied ethics courses, as they equip students with better mechanisms to resolve moral dilemmas likely to be encountered in their respective fields. These courses take what is typically taught in the philosophy department's ethics course and make it relevant specifically to the prospective lawyer, nurse, CEO or engineer. This application of theory into practice, however, is difficult and case studies are widely used to make such connections. Good case studies drive students to ask themselves questions like, why is the case at hand important to me? What relevance might it have to my future career? And the best case studies illustrate a point that is relevant, not only to a student's future career as a professional, but also to his or her life in general. It has been the author's intent to suggest that the key to success in using case studies in applied ethics courses lies in the careful selection of cases, as well as the relevant information contained therein, required to make a theoretical point clear.

Bibliography

1. See http://www.niee.org/murdoughCenter/ for additional information. Two other full-length case studies, *Gilbane Gold* and *Incident at Morales*, can be ordered here.

2. See Brock E. Barry and Matthew Ohland, "Applied Ethics in the Engineering, Health, Business, and Law Professions: a Comparison," in the *Journal of Engineering Education*, Vol. 98, No. 4, October 2009, p. 381. The authors suggest that the case-study method is clearly the most common in engineering ethics courses, yet they contend that "ethics literature appears devoid of studies that definitively point towards case-based instruction, or any other method, as the most effective means to teaching." I do not have such clear evidence or assessment results to conclude that teaching with case studies is the most effective method either, but I have been teaching philosophical and applied ethics for over 10 years, relying on case studies to varying degrees, so at least anecdotally I would agree with that conclusion.

3. Bertha, Carlos, "Engineering Ethics: Improving Pedagogical Methods" (IMECE2006-13569), 2006 ASME International Mechanical Engineering Congress and Exposition, November 5-10, 2006, Chicago, Illinois, USA.

4. Aristotle, *The Nicomachean Ethics*, in Richard McKeon (ed.), *The Basic Works of Aristotle*, Random House, NY, 1941. See in particular the end of book I.

5. See Jonsen A. R. and Toulmin, S., *The Abuse of Casuistry: A History of Moral Reasoning*, University of Chicago Press, 1988.

6. I do not have hard evidence (assessment results, detailed studies and the like) to prove that this collaborative teaching method works better than any other method. However, in the work referenced above (endnote 3) I elaborate on why I believe this arrangement is the optimal choice.

7. See Martin, Mike W. and Schinzinger, Ronald, *Ethics in Engineering*, 2nd ed., McGraw-Hill Inc., 1989, p. 43.

8. I have seen the "ethical decision-making process" primarily in the context of military ethics instruction, while serving as an instructor for the Army's Command and General Staff Course since 2006. This approach has recently been reworked and is no longer taught here. Having said that, Craig Titus, from Fairfield University, gave a presentation titled "Can Ethics Be Taught?: An Authentic Approach to Ethics Pedagogy" at the Association of Practical and Professional Ethics conference in March, 2010, that essentially argued in favor of using such a model to teach engineering ethics.