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Teaching Ethics in Engineering and Computer Science: A Panel Discussion*

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ABSTRACT: *At a conference, two engineering professors and a philosophy professor discussed the teaching of ethics in engineering and computer science. The panelists considered the integration of material on ethics into technical courses, the role of ethical theory in teaching applied ethics, the relationship between cases and codes of ethics, the enlisting of support of engineering faculty, the background needed to teach ethics, and the assessment of student outcomes. Several audience members contributed comments, particularly on teaching ethical theory and on student assessment.*

* This panel discussion took place at a mini-conference, *Practicing and Teaching Ethics in Engineering and Computing*, held during the Sixth Annual Meeting of the Association for Practical and Professional Ethics, Washington, D.C., March 8-9, 1997.

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PANEL DISCUSSION

This is an edited transcript of a ninety minute panel discussion on teaching ethics in engineering and computer science, at the mini-conference on *Practicing and Teaching Ethics in Engineering and Computing*. The mini-conference was part of the Sixth Annual Meeting of the Association for Practical and Professional Ethics, Washington, D.C., March 8-9, 1997.

The moderator, Michael Loui, prepared a list of possible discussion questions, and the audience voted on the questions of interest to them. Then he used the six questions that received the most votes. Panelists Moshe Kam, Charles Glagola, and Caroline Whitbeck were instructed to be lively, opinionated, and controversial.

Ethics in Courses

Loui: Should ethics be taught in stand-alone courses, in course modules, or in multiple courses, such as ethics across the curriculum?

Kam: Our opinion at Drexel University is that ethics should be introduced as part of a larger framework, consistent with our general philosophy about the undergraduate engineering curriculum. We have integrated the curriculum in the sense that we first present the students with a problem and convince them that there is a reason for them to study theoretical material in order to solve that problem. We try to recruit professors from different disciplines to teach engineering classes together. We don't even teach differential equations in a stand-alone course any more. Clearly, ethics should be taught as an interdisciplinary course. We think that if you try to teach it as a separate course, it gets detached. We think that ethics should be taught in conjunction with other classes—topical classes and laboratories—because we face many ethical problems in teaching. For example, plagiarism. It is much more effective, we think, to deal with these issues in classes that relate to the other topics than to present ethics as a totally detached and separate issue.

Glagola: Most engineering departments are just beginning to create engineering ethics courses, and it is difficult to determine the best way to do so. One problem, as with almost all courses, is resources and numbers of students. Joe Herkert had twenty-one to twenty-five students in his course, but when you have sixty students, it changes your opportunities. At the University of Florida, we teach ethics as a module in a course called "Professional Issues in Engineering." That is a very good platform. We schedule the ethics portion at the end. The first portion of the course is construction contracts and engineering—legal aspects of engineering—which deals with relatively subjective issues. So you bring the students along with subjective material for the first part of the course, which is not quite as challenging as subjective ethical issues, but it prepares them for the end of the course. We've discussed the possibility of doing ethics within courses, and I think this is an excellent idea, but once again the resources make

it difficult. Do you have one instructor who comes in and provides ethical teaching during a hydrodynamics course, and in a structural steel course, or should those instructors provide that ethical teaching within their own courses? Basically, though, I think it boils down to resources. How easy is it going to be to implement this within the department and be effective?

Whitbeck: I don't think it's an either/or choice, having been involved in both myself. Sometimes—for example, teaching research ethics—the best learning situations are not formal classes but activities involving both students and faculty. So I'd go for all three. Ethics should be in required technical courses throughout the curriculum. There should not be a required ethics course; there should be elective ethics courses. And then, for topics like research ethics, departmental activities. It's a bad idea to think about the technical subjects on Tuesday and Thursday and ethical questions on Monday and Wednesday. If we can't put the two together, then the students are less likely to.

Glagola: My engineering students prefer objective material. Subjective material is a challenge to them. To bring ethics into the core courses is an absolutely fabulous idea. If the structural engineering professor can present an ethical situation such as the "Fifty-Nine Story Crisis", that's wonderful. But I don't think the students are going to grasp it unless they have some grounding in ethical theory beforehand—a little bit of an understanding of utilitarian ethics and rights.

Kam: Drexel University is a co-op school. The undergraduate program requires five years of study, and our students spend six months in industry during their second, third, and fourth years in the program. The ethics class emerged from "horror stories" of students who came back from their co-op experiences. In order not to make it a separate class, we coordinated ethics with lab courses and history of technology courses that the students take. I agree that there is a serious issue of resources. Every time this course is taught, there are at least three instructors participating throughout the weekly two-hour period. We felt, however, that without any preparation for the co-op "crises" that our students will inevitably meet, we were doing them a disservice.

Whitbeck: I think that's wonderful when all the students have some practical experience. Students who have had some work experience are more receptive and eager to learn about these issues.

Glagola: I agree that co-op students have different perspectives on both technical and ethical material, because at work, students are exposed to different things than in a classroom. Those students have an edge when they return to campus.

Whitbeck: I said that it is important to incorporate ethics throughout the curriculum in the technical courses, but I should admit it is very hard to do. As the ethics instructor, you have to really collaborate with the people teaching the technical

courses. They have to understand exactly what you're doing; you have to understand exactly what they're doing in the technical courses. It is very labor-intensive to set up such a course. I just think that's the ideal we should strive for.

Glagola: Would you want individual instructors to be trained to be able to handle ethics themselves or to have somebody come in to the class during the course?

Whitbeck: Somebody might come in, but if the students think that the technical instructor is not paying attention and could not fill in if the other person got sick, it won't work.

Ethical Theory

Loui: Should the course start with a boring summary of ethical theories? On a scale of one to ten, where one is absolutely not and ten is metaphysical certitude, should it start with ethical theories?

Whitbeck: I have a strong view on that. It's a shame for engineering ethics, and some other areas of practical and professional ethics, to be tied to an approach to a philosophical ethics that was current in the 1950's, '60's, and '70's. Extremely interesting work in philosophical ethics has appeared in the last decade and a half from major philosophers representing a variety of schools of thought, philosophers such as Annette Baier, Alasdair MacIntyre, Bernard Williams, Kathryn Addelson, Amelie Rorty, Richard Rorty, Martha Nussbaum, Stanley Hauerwas, John McDermott, and Iris Young. But most of that work is not getting the attention it deserves in practical and professional ethics circles. About the only work in philosophical ethics since 1980 that we hear about even at the *Association for Practical and Professional Ethics* meetings are neo-Rawlsian theories of democratic process.

It is a shame that so many people seem unaware of the telling arguments that many of the philosophers I mentioned have given for thinking the project to found ethics on reason alone—on what supposedly all rational people would agree to—is a great mistake. They just assume that some sort of rationalist foundationalist program must be true and that the only question is whether the deontological version is better than the utilitarian, or the rights theorists give a better account than either.

Not that you shouldn't ever mention utilitarianism, but I would not bother to introduce it in a technical or even in a professional ethics course.You might have some reading from Kant or Mill, but I would not teach rationalist foundationalism of any stripe. That defunct scheme is as irrelevant as teaching students to ask whether everything is material substance or mental substance. The material substance versus mental substance question is one philosophers asked at the beginning of this century, and we learned that the question rests on mistaken assumptions.

Glagola: In my classes, I give the students a personality test similar to the Myers-Briggs test,* to challenge them to analyze their innate cognitive processes. Most the engineers are way over on the left side of the Myers-Briggs scale, the ESTJ's;* that would make them more utilitarian thinking. I challenge them not to be that way by presenting some basic issues of rights ethics and utilitarian ethics. As you said, these are older teaching methods, but if contemporary philosophers recommend different approaches, then we teachers need to know.

Whitbeck: It is good for students to understand rights, how they operate and the distinctions among different types of rights. It is good for them to understand the many forms of harms and boons. I have no objection to that. What I object to is philosophers presuming to tell everyone else what ethics is, that it all comes down to acting so as to produce the greatest good for the greatest number, or the like, and seeking then to apply such super principles to cases. Morality is a social product, and we have to understand the moral traditions that are involved.

Kam: Should the course start with a summary of ethical theory? My answer is no, because it's a very ineffective way to teach. In fact, we have abandoned this "theory first" approach throughout the undergraduate curriculum.We don't teach differential equations by stating first the existence and uniqueness theorems and proving them, as we used to do. Rather, we now start the differential equations course by bringing a robot to the classroom and saying, "Here is a nice robot that walks about; what do we need to do in order to design a path for it?" Pretty quickly you recognize that it would be sensible to model the robot, and when you recognize that it is sensible to model it, you find that calculus and differential equations are useful. We found that when we start our ethical component, it is much more effective to bring in a few cases for class discussion. Usually we first bring in the *Philadelphia Inquirer* from that week and open it and say, "Well there are some ethical problems here," even if at this stage we do that in a somewhat uneducated way. As the course progresses, we come back to these cases, we add theory as we go along. The level and the depth of discourse change as more theoretical background becomes available. We found that if we start the class by opening Chapter 4 and reciting the theory from there, we do not achieve that much, particularly not at the beginning of the course.

Glagola: I will agree with that at the beginning. I open the ethics portion with the *Gilbane Gold* video. I get students to identify ethical issues before having any training. Then they do the same thing for the video at the end of the course. And that's one way to see how they've progressed in their moral reasoning.

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* The Myers-Briggs Type Indicator is a test of psychological type. The four Myers-Briggs preferences are extroversion (E) vs. introversion (I), sensing (S) vs. intuition (N), thinking (T) vs. feeling (F), and judgment (J) vs. perception (P).

Codes or Cases?

Loui: Should the basic approach be code driven or case driven?

Whitbeck: One needs application to cases to really understand any codes or standards. I think we need to generalize the question and talk about the statements of ethical standards of behavior, of which codes are one type. Those standards are applied to problems and cases, and they develop in reciprocal relationship with cases and problems. I start students with the NSPE cases and the NSPE Board of Ethical Review's judgments on those cases that refer back to their code. Students may disagree with the way the NSPE judges those cases, but at least they see what a code is in application. They never just try to learn the code. Moral principles are always learned in a context of their application. You can't know anything if you just hear the words and don't understand the way those terms are applied and what their domain of reference is.

Glagola: I agree. We also present the code and the cases at the same time. Engineers like rules. They like not only to use examples but also to understand what is expected of them. The cases provide examples just like in their technical courses, where they are provided theory with examples.

Kam: The first question that I'm trying to answer when this class starts is, "Why are we here? Why are we looking at this? Why are these cases difficult?" And one of the first themes that I'm trying to instill is that the cases are often ambiguous. It's very difficult to come to an answer. You can't really open the scripture at a certain point and find an exact answer to the question. For a case that seems clear-cut at the beginning, if you add a few minor complications, it becomes enormously difficult to adjudicate. I find that the codes are not particularly helpful at this stage. The codes give students the sense that, although we are getting into very difficult territory, there is salvation because section 328 gives an "answer" to this question. That illusion should be resisted.

We offer a twenty-two week course. We try to get to the code on weeks 8 and 9. By this time the students already understand that an ultimate "answer" will not be found, and they understand the limitations of the codes very well with minimal explanations from the teachers. When we tried to do codes earlier, students often interpreted the codes as if they were the Bible. They would say, "well, this action should have been chosen because this section in the code says so." Now we introduce the codes later, when students understand the difficulty and complexity of the cases. The students develop respect for the codes but they also possess healthy suspicions toward them.

Loui: Do you like codes?

Glagola: I like codes because students understand they will be judged by the codes if they're called to task for their actions. And whether that's the right way or the

wrong way to do it—I personally think that it's the right way—I make them free-thinking with regard to the codes. This is similar to the difference between statute law and common law. You base a decision on the merits of the case, so you look at the codes in relation to how they may be applied in different ways. But as a professional, you'd be obligated to follow your code and you will be accountable for it.

Kam: There is another problem with the codes. Most engineers do not adhere to these codes and are not judged by these codes. Many engineers in many disciplines are not members of the disciplinary societies. The NSPE, for example, is a society which nary an electrical engineer belongs to. So I try to present a code as another source, another tool that an engineer can use, but not something that the engineer will be obligated to follow to the letter, particularly when the codes are sometimes self-contradictory and open to a lot of interpretation.

Glagola: I teach civil engineering. Most of our students will become registered professional engineers. They will be judged by the codes because they will put their seals on a set of drawings and become responsible for them. So do you look at ethics differently in electrical engineering than in civil engineering?

Enlisting Technical Faculty

Loui: You answered a question with a question, which is what philosophers should do. Let's talk about the faculty and the campus. How can we enlist engineering and computer science faculty?

Whitbeck: Some technical faculty are already interested in the ethical issues of their field. It's a question of finding them. In my experience, the percentage of faculty who are very interested in ethics increases with their prestige. If you go to the members of the National Academy of Engineering, you're more likely to get a favorable reception than you are with people who are scrambling to establish their technical reputations. Some young faculty are interested, but they feel they can't afford the time. And some feel that they're in competition with their colleagues, so they don't want to give their time to anything that won't increase their prestige. It's the ones who have a lot of prestige who say, "we've got to work on the important things, like ethics."

Kam: The question was how can engineering and computer science faculty be enlisted, and honestly I didn't know that there was a problem. The courses that have been established in the curriculum in ethics and professionalism at Drexel University originated in the College of Engineering and had "champions" in the College of Engineering. It may have to do with the fact that we are a private university. Students came back from their co-op experiences and described to us what they had endured. The industrial employers that employ our co-op students, and our past graduates, kept telling us that the problem is not that our students don't know their math, but that there

are other skills they do not master: for example, present an argument, interpret data, write well, speak well. The employers suggested that we address these deficiencies. We continually talk with our graduates. When we ask them what is difficult in the work place, we usually don't hear, "In Controls 3, you didn't teach me the following formula." What we do hear is that the ethical issues, the professional issues are the difficult ones. It is in these areas that our graduates lack training. For us, hearing this was "motivation enough", and consequently we didn't have difficulty in enlisting engineering professors to participate.

Glagola: You may have more ties with industry than some state universities such as ours. First, you need a person within the department who loves this subject and presents it in a way that challenges the students. Some faculty are interested and don't have the time; some are not interested at all and don't think "touchy-feely" things ought to be taught in an engineering curriculum. But what about enlisting and getting support from those who may have an interest but need further motivation? One way would be to bring in industry representatives to tell the faculty how important ethics is to them.

Kam: Our industrial sponsors basically require it from us, but there is more. We did not want to have, say, a teacher of thermodynamics who has absolutely nothing to do with the professionalism and ethics class, and use someone else as the "designated engineer" in the ethics class. What we are striving to do, and what we have done so far, is to make sure that the students see the same teachers: the person who teaches the thermodynamics class would also participate in the corresponding section of the ethics component. From the viewpoint of the student, this person is more "prestigious" because this person has the technical expertise; the fact that he or she teaches ethics means that it is as important as thermodynamics. The ethics class is put it on equal footing with the other topical classes.

Loui: But the faculty enjoy nothing so much as the esteem of their peers, and if it is not considered an important activity to many people, then how can we convince them that it is important and get the resources to teach ethics well?

Whitbeck: We should demonstrate what we're doing. I can remember the reaction of the syllabus review committee for new courses when I first offered my own course in real world ethics. Some faculty members had said, "Oh well, an ethics course. What could this have in it?" And then they read the syllabus and they said, "Oh, I take it all back." I think some people expect that the professor will preach to the students, and that there will be a semester long exhortation to be good people. When they learn what's really going on, when you have someone like Bill LeMessurier come and speak, when you have Roger Boisjoly come and speak, they say, "Oh, this is what we're dealing with. That's our lives." When they understand that the ethics is our lives—now I'm talking about our lives as engineers—then it's not a hard sell.

Kam: The only practical remedy that I can offer is to invite your colleagues to your classes. My experience is that it becomes contagious, once they see how it's run.

Background for Teaching Engineering Ethics or Computer Ethics

Loui: What kind of background or training would be needed to teach engineering ethics or computer ethics successfully?

Glagola: Is this a trick question? Basically I was self-taught. I also consulted with those at other universities who had already started engineering ethics programs and then developed my course. However, I think my participation in this forum has shown me that theoretical ethicists—theoretical ethicists with an interest in applying the theory to practical and professional issues—are a wonderful resource for setting up a training program to help prepare people who are developing ethics courses in engineering colleges.

Kam: From the engineering side, we found it very helpful for the engineering professors to have industrial experience. The professors that have taken the alternative route—I got my bachelor of science, and then I got my master of science, then I got my doctor of philosophy, and since then I have been teaching—have been somewhat less effective than people who worked, say, ten years in industry before they came back to academia.

Loui: I have been an academic all my life, and I think I could teach ethics pretty effectively.

Glagola: Do either of you have an opinion on the kind of training I have suggested?

Whitbeck: In general, the teacher should be someone who understands the problems, understands the issues, and also understands how to empower students. Those are the big things. Through services like the World Wide Web Ethics Center (http://ethics.cwru.edu), we have new opportunities to share excellent teaching material, so that whenever people do not know enough about a particular area within engineering, they can obtain cases with commentary—cases that have already been worked through. These materials enable teachers to stage a problem and make previous scholarship available to the students.

Assessment

Loui: How can student outcomes be assessed? How do we evaluate the student's progress?

Kam: Each of our eleven-week courses ends with two full days in which students debate each other on ethical problems in the following manner. In the first term, they

are assigned a topic. In the second term, they select a topic and they present it for our approval. And at the end of the term, they stand up and debate that topic from two opposing viewpoints. We ask them to apply in their arguments the concepts that they have learned during the term, that is to apply the theory that they have seen, to apply to codes to the extent that they are relevant—or explain why they are not relevant. It's a somewhat exhausting way of judging the students, as it takes two full days for all four of us to listen to them—and students are in the audience too—but we found that this is the ultimate test (in addition to written essays and the usual means of assessing progress), to see that the students have really mastered ethical reasoning.

Glagola: How many students do you ordinarily have?

Kam: We are running twice a year, and we teach 200 students a term.

Glagola: How many in a section?

Kam: About thirty.

Glagola: That's a luxury that we don't have, unfortunately. We have about sixty, and that makes it much more difficult than with thirty. And the assessment, obviously, is going to be different. I don't have teaching assistants with enough background to help with grading, the subjective evaluation which I think is necessary. You can't do evaluation objectively; you're just wasting your time if you give students a multiple-choice test. You have to challenge them and make them think. So one way is to try to baseline assessment. I show students *Gilbane Gold* and compare their initial analyses, at the beginning of the ethics module, with their final analyses, at the end.

Whitbeck: We haven't had the resources to conduct the kind of evaluations that I would like to see us do and that would help convince people to do more. I see students who arrive not knowing how they would approach a problem, and leave the course knowing how to approach a problem. We start with a lot of active learning exercises. Students learn first to speak in class, then they learn to interview people outside, and they come back with answers that they wanted. We discuss how to solve many kinds of problems, but the problems students choose for their final projects is up to them. We help them refine the problems, and then they interview people using those problems. When they've gotten answers, they have something they can take into their lives: it's not just the answer to one problem, it's the experience of getting answers. That's not a measure; I would like to do the measures as well. But what I see in students is what's gratifying; that's what keeps me in this work.

Teams

Kam: What would you say about the selection of teams and the selection of topics? There is a long debate about how you assign teams. One school of thought

says, let the students organize the teams, let the students select whom they will work with. Another school of thought says that engineers, particularly in the first few years of practice, do not choose their team members, nor should they choose their team members in school. In other words, let the teacher assign the teams and have them work together. A related issue is the selection of topics for students' debates. At present, we assign debate topics in the first term, but allow students to select topics for the second term, when the students are more 'mature'. This raises another question: when you ask students to debate, do you let them choose what side they are on? Or do you ask them to be prepared to present both sides of the issue and suggest that they reveal their own opinion only at the end? We didn't experiment with that yet. Right now the students select the side they want to support, but I'm wondering if this is something that I should try.

Whitbeck: I helped develop a role play for the introductory computer science course, which enrolls about five hundred students a semester. The role play involves a student who used some information about encryption software and inadvertently violated a copyright by giving the information to her high school. Her instructor hadn't told her that the course dealt with copyrighted materials. The roles are the student and representatives of other interested parties discussing how to resolve the issue. After playing one role, students switch roles—I think that is useful. However, as I have watched the dynamics in that role play, I see that the minority students can't as easily enter the conversation because they are less readily recognized by their majority peers. Role plays may reinforce some negative patterns. I think the selection of teams in technical courses is a very important ethical issue for engineering education these days. On the basis of a number of studies on the way things are now in engineering, in particular in the early years of the curriculum, I feel strongly that there should be women's sections of large engineering courses, because women do not get to try their hands at the full range of tasks as things are now.

Glagola: That's interesting. If we're going to cloister the minorities at that point, somewhere before we release them, we would need to get them to work in heterogeneous groups. They're not going to have a choice when they get out.

Whitbeck: The issues for minorities vary with the minority group. This semester, I noticed one African-American student coming out from a more advanced course in the big lecture hall, and a younger African-American student was entering the hall for the introductory course. The older student said to the freshman—or maybe sophomore—"Stick with it; they'll try to drive you out of the class, but stick with it." You see these human dramas. The classroom barriers to minorities and to women are, I think, still not being adequately addressed.

Glagola: I have tried it both ways: I have made a random selection of teams and then let the teams self-select. But what is my objective here? The class is not going to be effective if the teams aren't effective. So I just let them self-choose. And I find that

to be much more effective with regard to the students' learning within that course. I think that would be nice if it worked the other way, but it doesn't.

Comments from the Audience

Audience member #1: My question has to do with including ethical theory. I find I'm damned if I do and damned if I don't. On the occasions I've included ethical theory, the students say, "I wish you had done more," and the next time I do more, the students say, "I wish you had done less." I wish someone could give me the magic proportion.

Audience member #2: Right in the middle between the two.

Audience member #1: I would like to give students a broad introduction to both consequentialist and categorical approaches. What do you mean by bringing in Annette Baier? Do you give theory to students straight or neat?

Whitbeck: I'm saying any theory should be clearly relevant to the issues in practical ethics that we are addressing. If we, say, discuss utilitarianism—or consequentialism more generally—or the deontological response to the question, "What is the criterion on which the ethical acceptability of an act turns?," it is at best a distraction. Furthermore, as I mentioned, there is a lot of recent philosophical work that argues that the question, and the expectation of an abstract general answer, is itself a philosophical mistake. We do need to do conceptual reflection. There's a lot of recent philosophical ethics—for example, Annette Baier's work on trust—that informs what I do. I talk about some of it, I don't have them read a lot of essays by Baier in my engineering classes, but I do draw on philosophical work like hers in my own book which illustrates those philosophical points with examples familiar to engineers. I think it's important to have philosophical reflection, but I do not think it's right to teach engineering students philosophical jargon. I never hear engineering students say, "We wanted to hear more about utilitarianism and deontology." I've never had that experience. Has anybody else had that experience?

Kam: At the start of the course, I try to put myself in the shoes of the student, who asks himself or herself all the time, "Why do I need this?" I give a small portion of ethical theory, and I go back to the cases that we have discussed at length before. I try to show that the theory helps the thinking process, and in some cases it even helps you to come to a decision about the case. With this approach we provide a reason to study the theory. Often this makes the students want more theory.

Audience member #3: I think it depends entirely on how you present ethical theory. If you present it as "Here's what Aristotle said, now memorize it," it's totally counterproductive since students don't see the relevance of the theory. Instead, when I

teach engineers, I use the model analogy. When you introduce differential equations, you start not with the derivation of the equations, but with a robot, and it becomes clear that you need a differential equation to analyze its motion. In structural engineering, there are models for analyzing frames and beams. Ethics is no different. Engineers understand that you can use models, these normative theories, to think through problems and find a solution. It may not be the solution you want, but the analogy is there. So if you realize that you're actually using models, then suddenly it makes a lot of sense. It doesn't make any difference who thought of the model. Each model provides a method of doing ethical analysis. So you actually do end up teaching ethical theory. And I like teaching it because of that analogy. So I don't think you ought to eliminate ethical theory.

Whitbeck: But I'm not eliminating ethical theory. I'm only eliminating a certain kind of ethical theory, rationalist foundationalist theory. First, I never teach the students jargon. I don't teach them the word "utilitarian". Well, I mention the word "utilitarian". If you look at the engineering ethics books that accept the rationalist foundationalist assumption that a basis for ethics can be found in reason alone, you'll see each book has a different account of what is supposed to be the utilitarian position or the deontological position. You'd do better to just read an essay by Mill and talk about the essay. I recommend everyone here read Alasdair MacIntyre's essay, "Does Applied Ethics Rest on the Mistake?" It's one of the clearest statements of what's wrong with the rationalist foundationalist program. MacIntyre recommends that in philosophy courses you read Mill and Kant, but not accept the assumption that ethics rests on what rational beings, qua rational beings, can apprehend, and they apprehend those truths of ethics prior to any application of them to specific problems. MacIntyre argues that all moral rules are learned in application to a context and to problems. When we teach about utilitarianism or deontological theory, we often distort those theories anyway in order to say something useful and applicable to cases. Why not just chuck out the jargon and instead say, "Let's think systematically about benefiting people without harming them." You could phrase it in ways that are not doing violence to Kant or Mill, without teaching them jargon or assuming the legitimacy of the rationalist foundationalist program. It is especially important to avoid a side effect of teaching the jargon, that students believe that they should consider either consequences or virtues or rights or duties, depending on which ethical theory they hold. When we've got a moral problem, we should examine all the morally relevant considerations.

Audience member #4: I don't think there's a single right answer to this dialogue—should you or shouldn't you. In some sense this goes back to assessment, which for me means you should have a goal in mind. You can't assess something when you don't know what you're doing. When I was writing the second edition of my book on computer ethics, I was going to omit the second chapter, the theory chapter. I mentioned this to a number of people in computer science, and they didn't want to delete that chapter. They said that was the most important chapter in the book. Engineering and computer science students come in thinking, "Oh, ethics, it's all

subjective." And that chapter changes their attitudes, because it lends some authority and sets some ground rules for the discussion. I agree with you about language or jargon, but I always thought one reason for the chapter was to develop a common language.

Whitbeck: But the common language could be moral language. You could spend a lot of time talking about responsibilities, say, or trustworthiness or harm.

Audience member #4: The theory brings some depth to the common language.

Whitbeck: Computer science students are most comfortable with theory that looks like computer theory, in which you start from axioms and develop your system. That's how you communicate with computers. However, as many distinguished philosophers have argued, that is the wrong model for moral knowledge. (I think that the best minds who like to work on deductive theory are not going into philosophy any more. They're going to go into computer science.) The fact that students are comfortable with that kind of theory is not a reason for teaching it, if the theory rests on mistaken assumptions. Students also often want ethical problems to have simple unambiguous solutions, but that is not a good reason for pretending that they do.

Audience member #5: There are many ways to introduce more formal considerations usefully. I think that including some theory may be one way to go into depth about vocabulary—"right", "wrong", and so on—enough so that students see the subject is not merely subjective, but there is some orderly thinking.

Glagola: I see it exactly that way. Engineers like "yes, no, right, wrong." You throw utilitarianism way out here on this side, you throw extreme rights ethics out here on this side and you convince them that the answer is probably somewhere in between. And there is no real right or wrong answer to most of these questions, unless you go strictly by the code or unless you can reinforce it and defend your position.

Audience member #5: One other point, about grading. The issue becomes less clouded when taken in terms of your goals for the course: what your expectations are, what performance you will ask of students to meet those expectations. You formulate clear criteria that line up with the goals that you set out in the first place. That's reasonable in any course. One more thing. There's a lot of talk about role playing, and people in every discipline seem to approve of it, but there is precious little information about how to run role plays well. It would be nice to have some orderly suggestions and about how you set up role playing.

Audience member #6: I want to comment about assessment. I am a developmental psychologist who is involved in measurement kinds of issues. I would like people who teach applied courses to stop worrying about assessment so much, because I think it is hard to do. There are two goals in the teaching of these kinds of courses. One goal

relates to content: there, you can do traditional kinds of assessment. But there is a second goal that doesn't get measured for a period of years: the number of people who are involved either in good works or who are not involved in bad ones. So my plea is that if you want to deal with assessment in these kinds of courses, that's fine. You might be better off addressing grading in these courses, if it does have to be done, on a contractual basis where the student can do certain kinds of projects that earn particular grades, but I just wouldn't worry about assessment that somehow improves their moral reasoning.

Kam: I just want to tell you an anecdote. I was returning from a conference and I stopped at a 7-11 near Drexel University at 3:00 a.m. on a Saturday night. A group of students on co-op came running up to me, telling me, "we went to work at this chemical company, and the agent offered the engineers this and that, and we told him, you cannot take what he offers because the NSPE code doesn't allow that." I thought to myself, yes, this course was successful.

Audience member #7: There was a right answer in that case. There are a lot of cases where there is a right or wrong, no matter how you approach it. And when you emphasize the difficulties in the tough cases, students may become convinced that ethics is a fascinating parlor game, but it never helps in making decisions. You have to inform students that they don't always have to disagree, you don't always have to get the paradigm case in which consequential utilitarianism is diametrically opposed to Kant's second imperative. I think ethical theory is a tool, not to just play with but to solve problems. The most powerful cases are the ones that no matter which theory you use, it tells you that's wrong or that's right. I need those tools.

Audience member #8: Two quick comments on two separate issues. On evaluation. There's something that many of you know about called the DIT—Defining Issues Test. It's based on Kohlberg. Rest at Iowa and Self at Texas A&M that have used these in medicine and law. They give this test before a moral philosophy course and then they give it after—same test—and they compare the scores before and after. One of them came to us and said, "This has not been done in engineering. Can we try it on your engineering ethics group?" We said, "Sure." He gave it at the beginning of the course and he gave it at the end, and he said, "Something's wrong." "What's wrong?" "Well, your group scored lower than any group we ever gave this test at the beginning of the course and higher afterwards." I said, "You've got to talk to our dean." So he chatted with our dean. And the dean said, "We'll pay you 2000 bucks to run this a couple more times." That's part of what convinced the dean. There are some tools out there for assessment. You may not agree with Kohlberg but at least there is a tool out there for assessing how much the students think. Second, the issue of theory. We're struggling with that issue right now, while we're writing the revision of our book. We flip-flopped from one end of the spectrum to the other. Engineers think of themselves as practical problem-solvers. We used to start out with the theory before we wrote the book, and we got told, "Oh that's boring stuff." We got contrived solutions in

students' analyses of ethical problems. It didn't work, we knew that, so we changed. We submerged the theory way to the back of chapter 4, 5 and 6, and we started out with other stuff. Now the kids come back and tell us, "Hey, if you want us to solve these problems you've got to give us the theory first before you start asking us to do case analyses." We just reorganized the lectures and moved the theory back up front.

Whitbeck: Kohlberg tests for thinking the way John Rawls said ethical thinking occurs, but as I have argued, it at best disregards and may even discourage actual problem solving. You give students the illusion that addressing moral problems is, as one Kohlberg subject said, "a math problem with human beings."

Audience member #8: It works differently for different people, with different tasks, with different kinds of students, different numbers of students. We're not giving them an illusion—that's a terrible thing to say—I don't think that's fair at all. We're providing tools to students to address these problems in a rational way. We're not teaching a philosophy course here. We're teaching a professional ethics and responsibility course.

Whitbeck: The disagreement between utilitarians and deontologists is about the ultimate criterion for ethical behavior. It is not a difference in tools for solving problems. I agree that engineers are problem solvers, but if you're giving them some tools for problem solving, then you should call them "Tools for problem solving," and not take the labels from foundationalist theories.

Audience member #9: It's my experience that codes are usually used after the fact to say "Who did what wrong" or "Who did what right." I'd like to suggest that you should use codes as guidelines, and have students think of them in a proactive sense. There are two critical sentences in every code. One is about protecting the health, safety, and welfare of the public. The other is a powerful tool that usually says, if you bring up a serious problem to your immediate supervisors and they ignore you, then you have the right—in fact you have the duty—to go around them. I suggest that you ought to try to get students to use codes proactively to stop a disaster before it happens by referring to the code in advance. When people in the organization recognize that the core group that produces what they sell is trying to do the right thing, then maybe wrongdoing will stop.

Kam: Maybe I'm naive, but one of the reasons that the codes are not in wide use is that so little education in engineering ethics was going on. In our institution, we have had engineering programs for more than a hundred years, but most of the students hadn't seen a code of ethics in class until the last three or four years. And now we are graduating 400 students a year who have studied codes (along with the weaknesses of the codes). These students were instructed that they can use the professional ethics codes to tell someone, an employer, a client, a co-worker "I cannot do that because my code forbids this action." If engineering ethics as a topic becomes more prevalent, the

students that graduate will use codes as a standard tool, a tool that engineers did not possess before.

Audience member #10: I would recommend that the next time there's a conference on engineering ethics, that the relevance of ethical theory to engineering practice be one of the topics. I found the discussion fascinating. I have to disagree with one of the last comments made by Caroline, that the theory does not provide technique. I don't start with theories when I teach ethics in engineering or social work or anything else. I start with something I call "tracking the harms," and I try to get students to look at situations and see where the harms are, using "harms" in a morally neutral sense, but I eventually introduce theory in part because the concept of harm is theory-dependent. Different theories have different understandings of what harms there are, so you have to determine the relevance of the facts in terms of what the theory says is morally relevant, as you work through the cases. So theories aren't visions that have no particular relevance to actual practice, but turn out to be techniques to solving particular problems—at least in the sense of allowing you to determine what counts as a morally relevant fact and what doesn't count.

Whitbeck: I'm not at all against theoretical work in philosophy. All the philosophers I mentioned at the beginning say that the view that ethics is like logic is a defunct view. They are not saying that Kant is not worth reading, they're not saying Mill is not worth reading, and I certainly would not say that it's not worth reflecting on theories of harm. What I think is a real mistake is to teach students to either consider consequences or consider rights or consider obligations or consider virtues, to choose their theory, restrict their vocabulary and then defend that position. That is a real danger, especially when you set students up to debating theory instead of group problem solving.

Audience member #11: I may have a slightly different perspective because I teach in a business school. I find two reasons to teach something about ethical theory in my courses. One is that there is an obligatory chapter on ethics in every management textbook. These textbooks present strange views of ethical theories. I just finished a survey of all the textbooks used in our business school, and I found only one textbook that presented utilitarianism in a way that philosophers would recognize. Presenting ethical egoism and calling that utilitarianism doesn't do anyone a favor, but that's what is frequently done. There is some value in presenting an accurate picture of theory. The student is then prepared to deal with inaccurate presentations of theory when they are encountered in textbooks or lectures. The second reason for teaching theory is to empower students. I require students to analyze mini-cases by applying only one ethical theory to each situation. As each ethical theory is presented, they analyze one small case using only that theory. Then we discuss why none of the theories produces entirely satisfactory results. The students recognize that it is necessary to use elements of various theories to help recognize what's morally relevant and to develop approaches to moral problems. Without any initial intention on my part, this process

empowers students. They feel in control of what they've learned and internalize their knowledge. They find that they can criticize serious theory and be right. They find that their own thinking, in an area they considered foreign, deserves respect.

Loui: This has been an energetic and lively discussion. Thanks to all for participating.

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