ABET Team
UPRM

Ethics Across the Curriculum Workshop

ASEE
Session 0461
Liberal Education Division
June 16, 2002

Jose A. Cruz
William J. Frey
Halley D. Sanchez
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Event Details</th>
<th>Person in Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:30-12:45</td>
<td>Introduction</td>
<td>Intro of team</td>
<td>Halley/Bill</td>
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<td>12:45-1:30</td>
<td>Introductory Ethics</td>
<td>Integration Exercise</td>
<td>José</td>
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<td>1:30-1:45</td>
<td>Debriefing on Exercise</td>
<td>Moral Minimum Encapsulation of Ethical Theory</td>
<td>Halley/Bill</td>
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<td>(reinforcing points on exercise)</td>
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<td>1:45-2:00</td>
<td>Introduction to Gray Matters</td>
<td>Instructions Cases: Pacemaker and Inkjet</td>
<td>Bill</td>
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<td>2:00-2:30</td>
<td>Gray Matters</td>
<td>Discussion of scenario(s)</td>
<td>The team</td>
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<td>2:30-2:45</td>
<td>Writing Cases</td>
<td>Point of View Example Solutions Issues</td>
<td>Bill</td>
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<td>2:45-3:15</td>
<td>Breakout groups write cases</td>
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<td>Participants</td>
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<td>3:15-3:45</td>
<td>Breakout groups debrief</td>
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<td>Participants</td>
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<td>3:45-4:00</td>
<td>Closing Presentation</td>
<td>Things to keep in mind Coordination</td>
<td>Bill</td>
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<td>4:00-4:15</td>
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<td>Team or Liberal Education Representative</td>
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An Exercise in Ethical-Empowerment: Integrating Ethics in an Introduction to Computers Course

Faculty training through an "Interdisciplinary Research and Training Program in Ethics for Business, Science, and Engineering in the Puerto Rican Context (NSF grant SBR-9952958 and 9810253) has helped us develop exercises for integrating ethics across the curriculum. Two retreats and related activities provided the background for faculty to feel comfortable with the idea of integrating ethics into their courses. Some of the ideas developed were to consider ethics content when adopting new textbooks, discuss topics in ethics earlier in the semester, utilize sidebars and discussion exercises related to ethics found in many books, and to incorporate a discussion of current ethical issues.

Many more elaborate exercises emerged from the general discussion. One such exercise integrates ethics into the course content of an Introduction to Computers Course. This exercise provides exposure to ethics for a large number of students from many disciplines in their first or second year of college, provides them with the basic skills to develop arguments to support or refute ethical positions, and provides basic ethical skills that can be applied outside the context of computers and information technology.

Source: Textbook Exercise

This exercise is an adaptation of a textbook exercise that requires students to consider whether a scenario is a computer crime or not. The modified exercise provides more room for discussion, helps illustrate that ethical issues are not just "black or white" and provides more opportunity to discuss related ethical issues outside the context of computers and information and technology.

Students evaluate and discuss whether scenarios are ethical

The first step of the exercise is to have students individually evaluate 8 to 10 scenarios using the following 3 questions:

1. Do you think this situation is common/realistic? (Yes or No)
2. Do you think this situation is ethical or unethical? (Ethical or Unethical)
3. Do you think others may disagree with you? (Yes or No)

The first question emphasizes the fact that we are considering real-world issues. The second question asks students to provide an intuitive answer by evoking an honest, anonymous opinion on the issue. The third question serves to illustrate that the issues are not "black or white".

The scenarios can be taken from a variety of sources: from textbook exercises, from the newspaper, from novels and movies, in other words, any source that suggests something provocative and realistic. Many of the cases we developed in our NSF ethics initiative have been adopted to fit into this exercise.
Informal and Formal Discussion of Scenarios

During the first step, students reflect on the issues individually. In step two, the instructor leads an informal group discussion of a few of the scenarios. For example, the class could discuss whether using a computer at work to send e-mail to relatives is ethical. This simple statement has often generated 20 to 30 minutes of lively discussion. Some students will advocate one extreme (that the action is unethical) while others will argue the other extreme (that the action is customary and ethically permissible). Other students will try to secure the middle ground by citing circumstances in which it is ethically permissible (when workers are taking a break) and others when it is impermissible (when a worker spends too much time doing this).

Even as simple an exercise as this gives students good practice on framing moral arguments. Students will offer analogies based on the telephone, fax, or regular mail. Many offer examples from their own real-world experiences. Discussing the scenarios familiarizes students with the complexity of the issues, gives them practice in drawing analogies with their own experiences, and helps them to frame moral arguments.

Ethical Decision-Making Tests Provide Insight and Focus

The informal group discussion sets up the next stage since students already have raised many relevant issues in their comments. In the third step, several intuitive ethical tests are applied to two or three of the scenarios.

Reversibility: Would I think this a good choice if I were among those affected by it?
Publicity: Would I want this action published in the newspaper?
Harm: Does this action do less harm than a possible alternative?

These tests help students to formulate supporting arguments that evaluate the scenarios. Often during the informal group discussion, these tests have already been employed either by the students themselves or informally by the instructor. In either case, it is important for students to realize that they are thinking already in ethical terms and that their ethical reflection is complex and sophisticated. It is also helpful to use local idioms for expressing these notions (especially in Puerto Rico): the expression, "putting yourself in someone else's shoes" is, for example, a good way of presenting the reversibility test. This helps students realize that their parents, teachers, and religious leaders have passed on much of this "wisdom" to them.

Student Groups Re-evaluate Scenarios with Ethics Tests

The next step allows student to apply the ethics tests. In groups of three or four, the students select two or three scenarios and re-evaluate them, using the tests to sharpen their ethical arguments. The results are impressive: students quickly reach a consensus, back their position with well-constructed ethical arguments, and emerge from the discussion with more confidence. They are, in short, ethically-empowered. A debriefing session follows in which students summarize their group results with the rest of the class. This, in turn, generates more discussion.
Closure: Brief Discussion of the Importance of Ethics

The final step is a brief discussion to synthesize the exercise in its totality. Issues that can be raised: (1) awareness that ethics affects our behavior, (2) incorporating ethical considerations early in the decision-making process helps to avoid ethical dilemmas later on, (3) we can learn from past problems and adjust future actions to avoid their repetition, (4) everybody practices ethics, not just the so-called expert, and (5) generally speaking, "Good ethics is good business." We conclude the exercise with the slogan, "Be Ethical, be Wise."

Some students want to learn more…where to go from here?

Past experience indicates that this exercise has had a strong impact on many students. When they have asked where to learn more about ethics we have made the following suggestions: take a formal course in ethics, watch for ethical issues in the media, study professional and corporate codes of conduct, watch for ethics-related chapters and excerpts available in many textbooks. Finally, encourage them to discuss related situations (scenarios or experiences) with friends.

How does this promote ethical-empowerment?

What has impressed us most by this exercise is the way in which it changes the student's perspective on ethics in the direction of empowerment. In fact, it promotes ethical-empowerment in several ways.
1. Students learn to recognize ethical problems in real-world contexts.
2. Students discover that they are already thinking ethically. Employing the ethics tests produces a sense of recognition in the students of skills they already possess.
3. It gives students practice in formulating ethical arguments and gives them more confidence.
4. It excites further interest that often leads to follow-up activities.
5. This is an exercise that can be used by instructors who are not experts in ethics and can be integrated into the content of their classes. In fact, through careful selection of scenarios, students can be led to see how ethics is a natural and essential part of a real-world practice such as engineering, computer programming, or strategic planning.
Step 1: Individually evaluate the scenarios below using the following three questions:

For each of the scenarios below react to the following three questions:

1. Do you think this situation is common/realistic? **Yes** or **No**
2. Do you think this situation or activity is **Ethical** or **Unethical**?
3. Do you think others might disagree with you (Question #2)? **Yes** or **No**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Realistic? Y or N</th>
<th>Ethical? E or U</th>
<th>Disagreement? Y or N</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. An employee uses his or her PC at work to send e-mail to friends and relatives.</td>
<td>Y-N</td>
<td>E-U</td>
<td>Y-N</td>
</tr>
<tr>
<td>B. A company occasionally uses software to monitor the productivity of its staff. It only uses the software to monitor employees thought to be wasting time.</td>
<td>Y-N</td>
<td>E-U</td>
<td>Y-N</td>
</tr>
<tr>
<td>C. Engineering students use the university's computers to download pornographic pictures.</td>
<td>Y-N</td>
<td>E-U</td>
<td>Y-N</td>
</tr>
<tr>
<td>D. While reviewing e-mail messages a manager discovers someone using the company's e-mail system to operate a weekly betting pool.</td>
<td>Y-N</td>
<td>E-U</td>
<td>Y-N</td>
</tr>
<tr>
<td>E. A student sends life-threatening e-mail messages to other students. These messages also contain racist remarks. University administration officials debate on whether to expel the student.</td>
<td>Y-N</td>
<td>E-U</td>
<td>Y-N</td>
</tr>
<tr>
<td>F. In order to improve public education, the Puerto Rican government gives laptop computers to public school teachers.</td>
<td>Y-N</td>
<td>E-U</td>
<td>Y-N</td>
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<tr>
<td>G. A software engineer illegally downloads a library to help redesign a software program by the deadline stipulated by his employer. Legally downloading the library would cost his employer $10,000 which would not be refunded in the event that the program failed the testing procedures.</td>
<td>Y-N</td>
<td>E-U</td>
<td>Y-N</td>
</tr>
</tbody>
</table>
Step 2: Informally share or discuss your answers with the class. *Use the space below to make notes:*

Step 3: Ethical Decision Making Guidelines: Four *(informal)* tests:

**REVERSIBILITY:** Would I think this is a good choice if I were among those affected by it?

**PUBLICITY:** Would I want this action published in the newspaper?

**HARM:** Does this action do less harm than any available alternatives?

**FEASIBILITY:** Can this solution be implemented given time, technical, economic, legal, and political constraints?

Step 4: Divide into groups re-evaluate the remaining scenarios using the above tests, then share or discuss your group's answers with the class. *Use the space below to make notes.*

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Reversibility</th>
<th>Publicity</th>
<th>Harm</th>
<th>Feasibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (e-mail)</td>
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<td></td>
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<tr>
<td>B (monitoring)</td>
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<tr>
<td>C (pornographic pictures)</td>
<td></td>
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<td></td>
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<tr>
<td>D (betting pool)</td>
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<td></td>
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<tr>
<td>E (Threatening e-mails)</td>
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<tr>
<td>F (computers for teachers)</td>
<td></td>
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<td></td>
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<tr>
<td>G (illegal download)</td>
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</tbody>
</table>

University of Puerto Rico Ethics-Across-The-Curriculum Workshop
Ethics Integration Exercise Demonstration
By José A. Cruz-Cruz, UPR-Mayagüez
(Scenarios from EAC Workshop, May 14, 2001)

Step 1: Individually evaluate the scenarios below using the following three questions:

For each of the scenarios below react to the following three questions:

1. Do you think this situation is common/realistic? **Yes** or **No**
2. Do you think this situation or activity is **Ethical** or **Unethical**?
3. Do you think others might disagree with you (Question #2)? **Yes** or **No**

<table>
<thead>
<tr>
<th>Scenario Description</th>
<th>Realistic?</th>
<th>Ethical?</th>
<th>Disagreement?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. An advanced undergraduate course in Engineering Economics (a course that has both graduate and undergraduate students) requires a group project that comprises 40% of their grade. In the self-evaluation one group submitted, 4 of the students (all graduate students) claimed that a fifth (an undergraduate) did not do any work. The undergraduate, on the other hand, claimed that he tried to work but was excluded from the group project because he was an undergraduate.</td>
<td>Y-N</td>
<td>E-U</td>
<td>Y-N</td>
</tr>
<tr>
<td>B. An engineering manager has recommended an office re-layout. His plan includes moving several hourly employees under your supervision to a new site. You are concerned because your employees will have to travel between the old and new sites to perform certain functions, and the resulting increased transportation time costs have not been included in the analysis. The re-layout starts today.</td>
<td>Y-N</td>
<td>E-U</td>
<td>Y-N</td>
</tr>
<tr>
<td>C. A professor submitted an article in a scientific journal and did not include the name of the student who wrote the computer program that produced results central to the article. When the article was published and the student saw that his contribution was not mentioned, he called the professor and insulted him for not including him as co-author.</td>
<td>Y-N</td>
<td>E-U</td>
<td>Y-N</td>
</tr>
<tr>
<td>D. A student shows up to attend a review session for the reválda, the official examination for licensure in engineering. Before entering he meets a professor who has recently resigned from the department. This professor offers the student the chance to attend another review session that he is directing at a lower cost.</td>
<td>Y-N</td>
<td>E-U</td>
<td>Y-N</td>
</tr>
<tr>
<td>E. The president of an engineering association has publicly stated that a department in a well-known school of engineering does not offer courses in a certain area of engineering when in fact it does under a different course name. What should the department do?</td>
<td>Y-N</td>
<td>E-U</td>
<td>Y-N</td>
</tr>
<tr>
<td>F. An engineer working for a large multinational company discovers, upon studying several procurement contracts, that a key supplier is bribing somebody in the higher echelons (top management or board of directors). If he goes public with this situation, he will jeopardize his job.</td>
<td>Y-N</td>
<td>E-U</td>
<td>Y-N</td>
</tr>
<tr>
<td>G. A supervisor discovers that a public employee is illegally pocketing rent money from government properties. The supervisor turned over the evidence to the Department of Justice. However, the district attorney failed to attend the preliminary hearings for the trial, and the charges were dismissed. Some time later, this supervisor discovered that another employee was doing the same thing. Angry that the first employee got away with his illegal act, he approached the second employee and told him that he had a certified legal statement to the effect that the employee was robbing state funds. He demanded that the employee resign immediately or he would make this information public. The employee resigned. However, the supervisor had no such legal document. He was merely bluffing.</td>
<td>Y-N</td>
<td>E-U</td>
<td>Y-N</td>
</tr>
<tr>
<td>H. Engineer Juan del Pueblo has been called as an expert witness in a case in criminal court. Although he could give a quasi-technical presentation to convince the jury that the defendant is innocent, he knows that his presentation would not be precise enough to establish guilt or innocence beyond doubt.</td>
<td>Y-N</td>
<td>E-U</td>
<td>Y-N</td>
</tr>
</tbody>
</table>
Step 2: Informally share or discuss your answers with the class. *Use the space below to make notes:*

Step 3: Ethical Decision Making Guidelines: Four *(informal)* tests:

**REVERSIBILITY:** Would I think this is a good choice if I were among those affected by it?

**PUBLICITY:** Would I want this action published in the newspaper?

**HARM:** Does this action do less harm than any available alternatives?

**FEASIBILITY:** Can this solution be implemented given time, technical, economic, legal, and political constraints?

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<th>Publicity</th>
<th>Harm</th>
<th>Feasibility</th>
</tr>
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<tbody>
<tr>
<td>A</td>
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<tr>
<td>(the excluded undergraduate)</td>
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<td>B</td>
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<td></td>
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<tr>
<td>(the office re-layout)</td>
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<td>C</td>
<td></td>
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<tr>
<td>(the unmentioned student)</td>
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<td>D</td>
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<tr>
<td>(the cheaper review session)</td>
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<td>E</td>
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<tr>
<td>(false public declarations)</td>
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<td>F</td>
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<tr>
<td>(bribery)</td>
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<td>G</td>
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<tr>
<td>(bluffing for a good cause)</td>
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<tr>
<td>H</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>(the expert witness)</td>
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University of Puerto Rico Ethics-Across-The-Curriculum Workshop
Ethics Tests: Some Considerations

Many of the decision-making exercises presented in this website require employing different tests to generate and evaluate alternatives of action. This section is devoted to explaining these tests.

What are these tests?

The following three tests are particularly valuable because they conveniently encapsulate or telescope three commonly taught ethical approaches:

- **REVERSIBILITY**: Would I think this a good choice if I were among those affected by it?
- **PUBLICITY**: Would I want this action published in the newspaper?
- **HARM**: Does this action do less harm than any of the available alternatives?

Reversibility Test:

The *Reversibility Test* captures a central idea in Kantian formalism, the idea of reversibility. It is also the main idea behind the Golden Rule. Positively, it tells us to do to others what we would have them do to us. Negatively, don't do anything to someone that you would be unwilling to have them do to you.

Steps:
1. Determine *who* is going to be affected by your action.
2. Determine *how* they are going to be affected.
3. Reverse roles: put them in your place (as the agent or doer of the action) and yourself in their place (as the one subjected to the action).
4. Answer this question: If you were in their place, would you still find the action acceptable?

Closely related, alternative tests:
1. Does the proposed action treat others with respect? (Does it recognize their autonomy or circumvent it?)
2. Does the action violate the rights of others? (Examples of rights: free and informed consent, privacy, freedom of conscience, due process, property, freedom of expression)

Publicity Test:

In the *Publicity Test*, a person's actions manifest essential elements of his or her character. What we do reveals who we are. Our actions provide others with a window through which they can view our souls. Under this test, when I contemplate an action, I ask whether I would want to be known as the kind of person who would do this. For example, if the action were cowardly, would I want to be known as a coward? If the action were irresponsible, would I want to be revealed (to myself as well as to others) as irresponsible?

Steps:
1. Consider, first, that the action you are about to perform provides a window through which others can see who you really are.
2. Then take the perspective of those others who are about to judge your character through your action.
3. Ask the following question: Would others view you as a good person for what you are about to do?
4. Variation: Consider the following list of virtues: Responsibility, Honesty, Articulateness, Perseverance, Loyalty, Cooperativeness, Creative Imagination, Habit of documenting work, Civic-Mindedness, Courage, Openness to Correction, Commitment to Quality, and Integrity. Does your action manifest any of these? Does it manifest the opposite, i.e., vices such as cowardliness, dishonesty, etc?

**Harm Test:**

The *Harm Test* highlights an essential component of the utilitarian ethical approach, the goal of minimizing harm. In contemplating an action, we do our best to envision its consequences, especially those likely to take place and those whose occurrence would produce severe harm. We then compare different courses of action in terms of the harms they are likely to produce. The harm test tells us to choose the alternative that will minimize harm.

**Steps:**

1. Identify those who will be affected by your action.
2. Identify the impact your action will have on these people.
3. Determine whether this impact is harmful. (Does it violate any rights? Does it produce physical or mental suffering? Does it impose financial or non-financial costs? Does it deprive others of important or essential goods?)
4. Repeat these steps for the best available alternatives and compare them in terms of the net harm they produce.
5. Conclude by answering this question: Which alternative produces the least net harm?

Two other tests serve to round out the evaluation process:

- **Code of Ethics Test:** How does this choice stand in relation to the professional ethical standards of my profession?
- **Feasibility Test:** Can this solution be implemented given time, technical, economic, legal and social considerations?

**Code of Ethics Test:**

The code of ethics test asks that the agent benchmark the proposed course of action with the recommendations of a professional code of ethics. Engineers, for example, should look at the impact of their decisions on public health, safety, and welfare; almost all engineering codes identify this as the area of paramount responsibility.

**Steps:**

1. Identify the provisions in the code that are relevant to the case at hand.
2. Answer the following question: Does your proposed course of action violate any of these provisions?
3. Check for any inconsistencies, i.e., instances where an alternative satisfies some code provisions but not others. If there are inconsistencies, look for priority rules. (Example: many codes hold public health, safety, and welfare paramount.)

4. Hint: most codes can be divided into sections organized around relations between professionals and stakeholders of that profession. Four key groups are public, client, peers, and profession. Be sure to check code requirements from the point of view of these stakeholder groups.

**Feasibility Test:**

The *feasibility* test brings in a series of practical constraints by asking whether the selected alternative can be implemented given time, financial, legal, personal, and social constraints. By focusing the decision-maker on these constraints, the feasibility test helps to integrate ethical considerations with other aspects of a decision.

**Steps:**

1. **Time:** Is there a deadline within which your solution has to be enacted? Is this deadline fixed or is it negotiable?
2. **Financial:** Are there cost constraints on your solution? Are these fixed or are they negotiable?
3. **Legal:** Does your proposed alternative violate any laws or regulations? Are the legal constraints in line with the results of your ethical evaluation? If not, what can you do to align them?
4. **Personal:** Do the personalities of the people involved offer any constraints? For example, would your supervisor be open to persuasion, negotiation, or compromise? Or is he or she a dogmatic, close-minded, and inflexible person?
5. **Social, Cultural, or Political:** Consider where your solution is being implemented. How would its impact be viewed through the social, cultural, and political milieu in which it is being enacted? What would be its global implications?

**How can these ethics tests be used?**

Here are four uses for these ethics tests:

1. They can be used to uncover ethical problems embedded in concrete situations. For example, the reversibility test asks us to consider whether any rights are placed at risk by the contemplated course of action. The harm test prompts us to look for risks that are embedded in a given situation, and those likely to bear them. The publicity test helps us to see if the integrity of the agent is at risk in a given situation. Hence, the ethics tests help us to formulate ethical problems and to identify stakeholders and their stakes.

2. The ethics tests can also be used to evaluate alternatives of action. Consider the following scenario: *Your supervisor asks you to dump a drum full of toxic chemicals out in the field behind the plant. Should you do it, refuse to do it, refuse to do it and turn your supervisor in to the local authorities, or resign and get a new job?* The ethics tests provide us with standards we can use to evaluate these alternatives. For example, doing as your supervisor asks could (1) harm the environment and the health of people who live near the plant, (2) violate the reversibility test since it ignores their rights (especially if done secretly and without their consent), and (3) be viewed as cowardly by others were it to be publicly displayed.
3. The ethics tests also play a fundamental, *constitutive role in constructing solutions* to ethical problems that arise in the real world. For example in the above scenario, you would envision a solution that minimizes harm, is reversible with all stakeholders and preserves your integrity. With this in mind, you could inform your supervisor that dumping these chemicals is illegal and could be readily traced back to the company. Then you could provide concrete suggestions for redesigning the manufacturing process so that it would not produce toxic byproducts. The manufacturing process, through this new design, would become informed by ethical considerations: it would minimize harm, respect the public's right to a safe environment, and maintain the integrity of the agents involved. Here the ethics tests would play a constitutive role by shaping the very nature of the solution.

4. Finally, these tests *provide reasons* that can be appealed to in making ethical arguments. In the above scenario, you have reasons for refusing to carry out your supervisor's order: for example, it would produce harm (violate the harm test), place others at risk (which is not reversible), and expose you as a cowardly person who callously exposes others to severely diminished environmental and personal health. Students, armed with these standards, can use them to justify their arguments. Hence, the ethics tests structure and guide class discussion.

**How do these intuitive tests "telescope" full-blown ethical approaches?**

These tests encapsulate full-blown ethical approaches by highlighting an essential component of each theory. The reversibility test emphasizes the notion of reciprocity central to the ethical theories of Rawls and Kant. The harm test focuses on the idea of minimizing harm that is central to utilitarian theory. And the publicity test leads us to focus on those moral virtues and vices that we use to judge an individual's character.

**What are the ways in which students typically misuse or misinterpret these ethical tests?**  **What are the remedies that teachers can use to correct these problems?**

1. *Problems with the reversibility test.*

Problem: Many students misapply the reversibility test in situations where they are being asked to comply with a morally questionable proposal. Take the case of the supervisor ordering you to dump a drum of toxic chemicals in the field behind the plant. A group of students might claim that this would fail the reversibility test because it upsets the supervisor: if you changed places with her, you would be upset when she refused to carry out your order.

Remedy: There are several responses to this. First, would she really be upset that a subordinate refused to carry out an order that was illegal? Second, the issue in the reversibility test is not whether your action may upset someone, but whether it treats those who will be affected by your action with respect. Refusing to carry out your supervisor's illegal order is consistent with treating her with respect if, in your refusal, you make it clear that the grounds of your refusal are not your lack of respect but your concern about the illegality of the order; in other words you are not objecting to the person but to the order. Third, an action may not be reversible with all stakeholders...
especially if stakeholder interests conflict with one another. In this situation, you must work to honor all the conflicting interests. If this should prove impossible then you must honor those that have the highest moral value. Sacrificing the safety and health of the people living near your plant in order to keep from upsetting your supervisor seems to get it backwards. Finally, have them focus on the action of the supervisor. Is his action reversible in relation to you or to the public whose health and safety is at stake? If his action violates the test of reversibility and you, nevertheless, go along with it, then your compliance would also violate this test.

If students have trouble working with the idea of reversibility, have them substitute other closely related tests. The Golden Rule is familiar and turns on the notion of reversibility. Another alternative would be to have them look at the rights involved. (Formalist ethical approaches argue that reversibility underlies our system of basic human rights and duties.) A third alternative is to have them examine whether their course of action treats stakeholders with respect or upholds their dignity.

2. Reducing the reversibility test to the harm test.

Problem: Closely related to the previous problem is the tendency to reduce the reversibility test to the harm test. Often the question, "Would I think this a good choice if I were among those affected?" gets converted into the question, "What impact would my proposed action have on others?"

Remedy: Point out that the reversibility test focuses, not on the consequences of your proposed action, but on whether this action treats others with respect. Does it circumvent their ability to make decisions for themselves? Does it deceive or manipulate them? Is it paternalistic toward others in that it seeks to make decisions for them that they are capable of making themselves? Results may enter into the answers to these questions but they are not the central issue; the central issue, again, is whether the proposed action treats others with dignity.

3. Reducing the publicity test to the harm test.

Problem: Many students reduce the publicity test to the harm test by considering only the consequences of making the action public. For example, blowing the whistle on the company for illegal dumping of toxic wastes would fail the publicity test (under this misconception) because the consequences of making this dumping public would be the loss of your job and the adverse publicity suffered by your company.

Remedy: Any utilitarian calculation would include weighing the risk to your job and your company's image against the benefits brought to the public by revealing to them the illegal dumping. But this is the job of the harm principle, not the publicity principle. The issue here is what your action reveals about you the agent. What would people think about you if you passively went along with this illegal dumping? (Would they consider you a coward?) What would people think about you if you resisted this action, even to the point of going public and putting your job at risk? (Would they see you as a person of moral integrity who strives to do what is right even at the expense of personal
Perhaps your coworkers would look at you as a snitch but this would have to be weighed against the way the public you are trying to protect would view your action. Application of the publicity test can get complicated. But students can sort through most of this by keeping focused on the issue of what this action says about the agent as a moral person. Assume that our actions provide a window into our souls. What, then, does this particular action say about you as a person? Do you want to be known as the kind of person who would do this?

4. **Problems in integrating the different tests.**

Problem: Many students treat these tests as representing different, competing theories. Thus, they go on to import several preconceptions about scientific theories into their thinking about the ethical approaches these tests encapsulate. They reason that ethical theories—like the scientific theories of creationism and evolution—represent exclusive accounts of the same phenomena. As a result, they will employ only one ethical test (usually the harm test), reasoning that it is best suited to the situation and then assume that a different test would lead to a different, even contradictory, conclusion.

Remedy: Ethical approaches are more like different perspectives on a multi-dimensional object than mutually exclusive accounts of the same phenomena. Instead of contradicting one another, they complement each other; each compensates for the limitations of the others.

An analogy will help here. When we go to buy a house and the view from the outside perspective is different from the view from the inside perspective, we don't conclude that one view contradicts the other; rather we seek to integrate the two different, partial views into a complete and comprehensive view of the whole house. It is the same when we turn to ethical approaches. Each approach offers a view of a different aspect of the action; reversibility focuses on the internal dimension of the action (the formal characteristics of consistency, reversibility, and universality), harm on the outer dimension (its consequences or results), and publicity on the agent (the action provides a window into the agent's soul). This analogy helps convey the importance of employing all approaches, using each to address the limits of the other, and harmonizing any differences that may emerge.

5. **Using the tests to rationalize decisions made on other grounds.**

Problem: Sometimes, students will make their decisions based on non-ethical grounds such as expediency, self-interest, or company interest. Having made the decision on these grounds, they will try to dress it up using the ethics tests.

Remedy: Provide a more probing analysis of the ethics of their solution. Often other students in the class will help.
Instructor's Manual: Ethical Problem Solving in Engineering—Gray Matters

I. Goal of activity:
The goal of this activity is to promote ethical evaluation and ethical integration skills. Evaluative skills concern the ability to assess an action or a policy in terms of different ethical approaches such as utilitarianism, deontology, or virtue theory. Integrative skills promote the insertion of ethical considerations into a decision or design so that these considerations play a constitutive role in the final product; they help us to structure a design using ethical considerations, rather than adding these onto an already completed design as an after thought.

II. Description:
Students are provided with 5 to 10 short scenarios (one paragraph case studies), which are crafted to elicit a decision. An example:

*Your supervisor asks you to dump the contents of a drum of toxic waste products behind the factory. What should you do?*

The scenario is followed by several solution alternatives, i.e., suggested courses of action that purport to solve the problem raised by the scenario. To return to the above example, you could…

a. refuse to follow the order
b. follow the order
c. complain to your supervisor's supervisor
d. look for a new job
e. Your solution…

Students first read the scenarios and the solutions that accompany them. Then they compare and rank the solutions in terms of the following tests:

**REVERSIBILITY:** Would I think this is a good choice if I were among those affected by it?

**PUBLICITY:** Would I want this action published in the newspaper?

**HARM:** Does this action do less harm than any available alternatives?

**FEASIBILITY:** Can this solution be implemented given time, technical, economic, legal, and political constraints?

The objective is to find the solution that best integrates the considerations encapsulated in these tests.

III. Instructions:
*Short Version* (1 class period or less)
a. Read the scenario and the solutions that follow.
b. Choose from among the solutions offered the one you think is the best and the one you think is the worst.
c. Using the ethics and feasibility tests, justify your choices, i.e., explain why your worst choice is in fact the worst and your best choice the best.
d. Consider what you would do if you were in this situation. Would you choose one of the solutions offered? Or would you design a different solution?
e. Meta-thinking What questions and problems arise as you employ the ethics tests and decision making frameworks?

Variations (These activities can be added to the above if there is more time)
a. Divide the students into groups of 4 or 5 and have them carry out the above steps. Then have each group debrief on their deliberations.
b. Rank the solutions. Give each a numerical score or a letter grade. Justify your score or grade.
c. Dramatize the scenarios. Dramatize how you would implement your solution.
c. Prepare a solution evaluation matrix like the following (prepared for the video, Gilbane Gold)

Solution Evaluation Matrix:

<table>
<thead>
<tr>
<th>Alternative/ Test</th>
<th>Feasibility Test (Check time, money, technical, and social factors)</th>
<th>Reversibility Test (Apply reversibility test to alternatives)</th>
<th>Harm Test (Apply harm test to alternatives)</th>
<th>Publicity Test (Apply publicity test to alternatives)</th>
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<tbody>
<tr>
<td>Alternative One</td>
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<td>Alternative Two</td>
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<td>Alternative Three</td>
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<td>Alternative Four</td>
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<td>Alternative Five</td>
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</table>

e. Work through the scenarios using the following decision making framework:

- Identify the relevant facts
- Identify the stakeholders, their stakes, and possible conflicts between stakeholders and stakes.
- Formulate a problem statement. (Classify the problem as a disagreement, conflict, or line drawing problem)
- Brainstorm solutions to the problem
- Evaluate these solutions using ethics and feasibility tests
- Make a decision
- Implement your decision and develop preventive measures

IV. Source of Activity:
This exercise was partially suggested by Gray Matters, a game produced by the Lockheed Marietta Corporation as a part of its corporate ethics program. (It was written by George Sammet for Martin Marietta.) We also consulted the discussion of this activity in Dr. Carolyn Whitbeck's book, Ethics in Engineering Practice and Research.

The general orientation of our activity is different from Gray Matters. While we seek to promote the ethical empowerment skills of integration and evaluation, Gray Matters is used primarily to inform workers about company policy on ethical matters.

The scenarios we have used in the enclosed versions of this activity come from cases prepared through NSF grant SBR-9810253 and previous ABET ethics workshops. These cases have been shortened into scenarios and altered to elicit ethical decisions.

Writing Scenarios or Cases for Ethics Integration Exercises

I. Why Use Cases?
Discussing cases or scenarios helps students to learn ethics. You can use real world cases or fictional cases taken from literature or the cinema. Whatever the source, the cases should reflect typical situations that students are likely to encounter when they turn to practicing engineering after graduation. Hence, it is important to find everyday instances (little news/bad news cases) along with "big news/bad news" cases like the Challenger explosion, the Ford Pinto case, and Three Mile Island.

Discussing cases leads students to refine and modify their views. Often this is in response to the arguments of their teachers and peers. Closure (say agreement on a solution to the problem) may be possible but it is not always necessary. What is important is to expose students to different arguments and give them an opportunity to practice using ethics tests and decision-making frameworks on real world scenarios.

II. Voices (Perspectives from which you can write and discuss cases)
There are two perspectives from which to write and discuss scenarios: the evaluator or judge perspective and the participant perspective. In the evaluator perspective, the student takes up a standpoint outside the case; he or she evaluates the participants and their deeds in terms of different ethical considerations—how much harm they brought about, whether they violated rights or duties, and whether they maintained personal integrity throughout the scenario. In the participant perspective, on the other hand, the student takes on the role of one of the participants and makes a decision from that perspective. The case ends inconclusively, that is, it is interrupted at a moment of decision. The student then resolves the case by making a decision using various ethical
and feasibility tests both to guide the process of forming the alternatives and to decide on the best one available. Thus the student makes a decision in the face of uncertainty and under conflicting constraints, while attempting to integrate ethical considerations into the formation of the decision itself.

III. An Example: UPRM Students Rewrite a Case

An example, from our case writing initiative, will help clarify this distinction between these two perspectives:

**Version One:**

A lobster aquaculture project located in Ponce, Puerto Rico was closed by federal environmental agents from New York. Two reasons for the closure were given: 1) the administrators of the project did not have the necessary permits for dumping the water contaminated by the lobsters into the sea and 2) neighbors had reported to various agencies on multiple occasions that the owners were killing the albatrosses which circled the tanks and ate the lobsters without regard to the fact that the albatross found on Ponce's beaches is an endangered species.

The aquaculture owners denied knowledge of violation of any environmental laws, further indicating that they had not been previously notified about the offenses and explained that they killed the albatrosses only in defense of their property.

Questions:
1. Why were the federal agents wrong in closing the business? What conditions should the federal authorities comply with before legitimately closing this aquaculture business? Why?
2. Why were the federal agents correct in closing the business? What actions should the project's owner have taken before the federal authorities were obligated to close the business? Why?
3. Is there any solution that avoids the necessity of killing the albatrosses and leads to the reopening of the business? Discuss this possibility and write a proposal.

**Version Two:**

A group of students rewrote this case in the following form:

- The EPA has informed an aquaculture facility that they are in violation of environmental regulations (shooting endangered birds and improper disposal of waste water). This facility has two months to submit a compliance report. To write this report, they have hired a group of engineers as consultants. You are one of the consultants. Your job is to write a report that describes several possible compliance responses. Include information on how to implement these responses and their costs.
Comparison:
The student version displays several differences from the original:
1. It places the analyzer in the participatory point of view, rather than the evaluator point of view assumed in the first version.
2. The new version elicits a decision that integrates technical and ethical components; it is interdisciplinary.
3. The new version formulates the problem so that its solution requires the integration of engineering skills with ethical and environmental sensitivity. The students solve the ethical and environmental components of the problem by means of their engineering skills; they don't have to stop being engineers to become ethical.
4. The student version elicits a proactive response; the participant anticipates the closing and develops means to prevent it. The original version begins with the EPA closing the aquaculture facility and then asks for a retroactive judgment on the rightness or wrongness of this decision.

IV. Writing Cases
Guidelines:
• Choose your topic so that it integrates nicely into your class
• Choose the perspective or voice of the case (For example, whether it is an evaluative or participative case, whether it is interdisciplinary, whether it is proactive or reactive, etc)
• Choose when to end the case (You can terminate the case when all the consequences have manifested themselves. Or you can interrupt the case at the moment of decision. If the case has an ending, you can elicit a decision, present the decision actually taken and allow students to compare the two.)

Solutions for Gray Matters:
(Build around four generic responses)
• give in
• negotiate
• oppose
• resign

Checklist (Modified from Michael Davis, Ethics and the University, p. 173)
• Is the story line clear?
• Does the scenario present a real world situation?
• Does the case contain the right amount of information? (Avoid the extremes of too much and too little information)
• Does the case present a clear narrative?
• Does the case raise issues appropriate for your class? (Ideal: the student must solve technical and mathematical problems to get to the ethical issue)
• Will the case be interesting to your students?
• Spend time clarifying what you want to achieve with this case? (Do you want to present an ethical issue, give students practice making decisions, or raise ethical awareness?)
V. Ethical Issues (Possible scenario subjects)

From codes of ethics

- public health, safety, and welfare
- avoiding conflicts of interest
- maintaining confidences
- faithful agency
- collegiality
- upholding the honor, integrity, and the reputation of the profession
- promoting professional autonomy

Impact CS issues for computer engineering

- quality of life
- use of power
- risk and reliability
- property rights
- privacy
- honesty and deception

Issues identified by business, science, and engineer teachers and practitioners in Puerto Rico (from NSF SBR-9810253)

- Academic ethics: cheating, plagiarism, peer pressure, bribery, "heart-breaking stories", report and term paper recycling, trading authorship, project trading, office hours, peer evaluations
- Research ethics: manipulation/fabrication of data, stealing intellectual property, use/abuse of authority
- Professionals in the Workplace: time stealing, safety/risk, misuse of contacts and influence, relaxation of standards due to economic and time pressures, prioritizing in the face of time and resource shortages, corruption
- Real World Pressures: technical, economic, political, regulatory, competition, product quality, regulations, deadlines, profits, job security, handling mistakes that have to do with time, team, or task pressures, codes of ethics, team work

Assessment:

Assessment forms an integral part of ABET's tripartite framework: (1) objectives and outcomes, (2) documentation and assessment, and (3) plan for continual improvement. Hence, it is important to follow up ethics integration activities with an assessment of their effectiveness.

We have provided the following forms to get this assessment process started. The first form is a general survey designed to identify ways in which students are already exposed to ethics. It can be modified to pick out activities held at your university. The second form is designed to assess ethics integration exercises involving cases; it can be used to assess the effectiveness of the cases used and can provide information for rewriting and refining them. The third exercise is designed to assess the different modules or ethics integration exercises that we at UPRM have integrated into our practical and professional ethics classes. It assesses several such exercises and provides a chance to compare them.
Remember two important things: (1) You may not get it right the first time out—but don't give up. (2) Take time to evaluate the activity yourself, have the students assess it, then make adjustments for the next time. We (Center for Philosophy in its Interdisciplinary Function) are developing a Web Page in which we plan to publish our integration exercises and the results of our assessments. We also plan to start a newsletter dealing with efforts at ethics-across-the-curriculum which will feature an "exercise of the month," that is, an exercise which someone has tried out, assessed and modified.
# Form for Evaluating ABET-2000 Ethics Integration Exercises

**Course and Section:**

**Purpose:** To determine the number and types of exposure to ethical considerations.

**Directions:** Below are a series of activities in ethics that have been carried out in conjunction with ABET-2000, Criterion 3, f and h, and Criterion 4. Assess your exposure to each activity using the following scale:

1. Poor or no exposure
2. Less than adequate exposure
3. Adequate exposure
4. Good exposure
5. Excellent exposure

<table>
<thead>
<tr>
<th>Activity</th>
<th>1</th>
<th>2</th>
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<th>4</th>
<th>5</th>
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<tbody>
<tr>
<td>Read parts of an engineering code of ethics (Examples: CIAPR, NSPE, ABET, ECPD, ASME, IEEE, ASCE, ASChE).</td>
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<td>Participated in an activity that has a major ethical component (meeting of a student professional society).</td>
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<td>Attended a special lecture or conference (outside of regular classes) with a major ethical component.</td>
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<td>Spent time identifying and addressing the ethical issues in a major design experience.</td>
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<td>Took a course in ethics (Introduction to Ethics, Business Ethics, Engineering Ethics, Bioethics, Modern and Contemporary Ethics).</td>
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<td>Discussed ethics study questions for the Revalida.</td>
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<td>An engineering instructor included an ethics module in one of his or her classes. (Example: case discussion)</td>
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<td>A guest lecturer came to one of your classes and discussed ethical issues in engineering.</td>
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<td>Participated in an ethics competition such as the ethics bowl.</td>
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<td>Participated in drafting a student code of ethics for my student association or for coop internship students</td>
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# GENERAL MODULE EVALUATION FORM

**DIRECTIONS:** You have just completed an exercise designed to show how ethics is a part of and can be integrated into the activity of computing. We would like your impute on how effective you found this exercise. Assess these different topics using the following scale:

1. Strongly Disagree  
2. Disagree  
3. Neither agree or disagree  
4. Agree  
5. Strongly Agree

<table>
<thead>
<tr>
<th>ETHICS INTEGRATION MODULE</th>
<th>1</th>
<th>2</th>
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<tbody>
<tr>
<td>I found the cases in this exercise interesting.</td>
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<td>The cases in this exercise are representative of situations that occur in the real world.</td>
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<td>These cases made me more aware of the ethical issues that arise in computing.</td>
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<td>I understand the ethics tests that were used in this exercise.</td>
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<td>I was able to integrate these ethics tests into the cases presented in this exercise.</td>
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<td>It was helpful to discuss these cases in small groups with other students.</td>
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<td>I learned something from the class discussion of this exercise.</td>
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<td>I would rather discuss fewer cases in more detail.</td>
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<tr>
<td>I would rather discuss more cases in less detail.</td>
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<td>After this exercise, I have a better idea of how to integrate ethical considerations into computing.</td>
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<td>I recommend that this exercise be dropped from this course.</td>
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<td>Overall I think this was a good exercise.</td>
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</table>
1. What did you find most helpful about this exercise? Explain

2. What did you find least helpful about this exercise? Explain

3. What topics were covered that you found helpful?

4. What topics were left out that should have been covered?

5. What would you have liked to have said during this class but were unable to say for some reason such as time?
MODULE EVALUATION FORM

DIRECTIONS: Below are a series of ethics modules designed to integrate ethics across the engineering curriculum in accordance with ABET-2000, Criterion 3, f and h, and Criterion 4. Assess your exposure to each activity using the following scale:

1  Poor
2  Less than adequate
3  Adequate
4  Good
5  Excellent

<table>
<thead>
<tr>
<th>ETHICS INTEGRATION MODULE</th>
<th>1</th>
<th>2</th>
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<tr>
<td>Ethics Integration Exercise: Short Scenario Pre-Test</td>
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<td>Ethics Evaluation Exercise (Scenarios in computer ethics with solutions to be graded and ranked)</td>
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<td>Ethics Decision Making Exercise (Making, justifying, and implementing decisions in Hughes Aircraft Case)</td>
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<tr>
<td>Ethics Decision Making Exercise (Making, justifying, and implementing decisions in Hughes Aircraft Case)</td>
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<td>Social Impact Statements (To be carried out in conjunction with capstone major design experience)</td>
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<td>Service Learning Project</td>
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<td>Computer Ethics Course</td>
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1. Which ethics integration exercise did you find most helpful? Why?

2. Which ethics integration exercise did you find least helpful? Why?

3. Do you feel that you have changed your mind concerning the importance of ethics in computing over your undergraduate experience? Explain.
Decision-Making in Engineering
By William J. Frey, José A. Cruz, and Halley D. Sanchez
Cases Developed Through NSF SBR-9810253 and UPRM ABET EAC Workshops
Directions: Read the following scenarios and the accompanying solutions. Evaluate the alternatives in terms of the following tests. Choose the one you think best or design your own solution.

REVERSIBILITY: Would I think this is a good choice if I were among those affected by it?
PUBLICITY: Would I want this action published in the newspaper?
HARM: Does this action do less harm than any available alternatives?
CODE TEST: Does the solution alternative carry out or violate any code provisions?
FEASIBILITY: Can this solution be implemented given time, technical, economic, legal, and political constraints?

Scenarios:
1. Juan is a software engineer who has just started working for company ABC. His first assignment is to redesign a software program in less than a month. He can think of only one way to do this: download a library and integrate it into the program. But to make a legal download, the company must first pay $10,000 to the manufacturer. This is a gamble: if the library cannot be integrated into the program, ABC doesn't get its money back. Furthermore, it will take more than a month to purchase it from the manufacturer. What should Juan do?
a. Illegally download the library, integrate it into the program, and test it. If it passes the test, then Juan can recommend to ABC that it pay the manufacturer the $10,000.
b. Go to his supervisor at ABC and ask for more time to redesign the software.
c. Recommend to ABC that they pay the manufacturer $10,000 even though they will not get a refund should the software fail the test. He could also enlist ABC's help in pushing the manufacturer to make the library available in less than the usual time.
d. Look for another job. He'll get ulcers if ABC keeps imposing unrealistic deadlines on him.
e. Your solution…

2. You are a recent graduate from UPRM and are trying to start up your own business in the construction industry. Town Z opens the bidding on a lucrative construction project. When you mention to a friend that you are thinking of submitting a bid, he tells you that it will not be successful unless you make a hefty campaign contribution to the mayor's reelection bid. He suggests that you inflate your bid to include the campaign contribution and hide this by padding other budget items. What should you do?
a. Do exactly as your friend says. After all, it is common practice, and you are as entitled to that bid as any other contractor.
b. Submit an honest bid and make no contribution to the mayor's reelection campaign. If this is the way the mayor does business, you want no part of it. Bribery violates your ethical and professional principles.
c. Do as your friend says but just this one time. Once you get your construction firm started you can then operate it with integrity.
d. Blow the whistle on this corrupt mayor. You could go to the local press, a government official, or your professional society.
e. Your solution…

3. Julio has been working for the civil engineering firm of Pedro for nearly five years now. He began while still a student and has continued after his graduation. Pedro has been like a father to Julio, teaching him about civil engineering and introducing him to valuable clients. But the pay is poor. Julio has asked Pedro several times for more money but it has not been forthcoming.
   Julio has been thinking for some time about starting his own firm. He has made valuable contacts while working with Pedro and is sure that he would have enough clients to do a good business. But he is concerned about the propriety of taking clients away from Pedro. What should he do?
a. Go on ahead and start his own firm. He has given Pedro five years of hard work and has paid his dues.
b. Talk the matter over with Pedro. If he objects, then Julio should abandon his plans of starting up his own firm.
c. Go ahead and start his own firm. But if he gets a contract from one of Pedro's clients, he should subcontract some of the work to his former employer.
d. Start his own firm but refuse to accept business from any of Pedro's clients.
e. Your solution…

4. You are an electrical engineer and have been practicing as a professional engineer for five years now. A close friend and cousin of yours has just completed a one year vocational draftsmanship program and comes to you with a proposal. He will develop blueprints for clients at $75 dollars a page, and bring you the final version for you to sign off on for anywhere from $200 to $300 (depending on the complexity). You keep the fee for signing off on the blueprints while he keeps the $75 per page fee. What should you do?
a. Don't do it! This would violate canon 2 of the CIAPR's code of ethics.
b. Don't do it! Even though it doesn't violate canon 2, it violates 5j.
c. Do it. After all, it's common practice and your cousin is perfectly capable of drawing up adequate blueprints. (It's also good for the family, and your uncle would vouch for him.)
d. Consult with someone (an official of the CIAPR or one of your former university professors) to see if this would be a violation of the spirit of the engineering code of ethics.
e. Your solution…

5. An engineer has been hired by a lawyer to serve as an expert witness for his client, an accident victim. The engineer's responsibility is to prepare a formal, technical report that includes (1) a statement of the available facts, (2) the methodology used by the engineer in her investigation, (3) the technical results of that investigation, and (4) the "expert witness opinion" which is based on the results of the scientific investigation. She will offer her services for a flat fee.

She has been hired by a lawyer who is representing the injury victim in court. The lawyer tells her to provide a minimal, incomplete report that leaves out information that will likely be essential to the trial. When it becomes necessary to provide further information, the lawyer will bill the client for the additional work done by the engineer. The lawyer puts it this way: "My client has all kinds of money, so we can milk him for additional fees. Then you and I can split the money. Don't worry, everybody does it."

She is uncomfortable with this arrangement, but the attorney is well known, established, and in a position to throw a great deal of work her way. She needs all the work she can get. And the client is loaded. So what should she do?
a. Go along with the attorney: leave out essential information and charge for additions to the report. Then split the money with him.
b. Quit on the spot. No matter how much you need the money, you are not going to get it by deceiving the client. This is a clear violation of canon 4 issues.
c. Pretend to go along with the lawyer, but write a complete report anyway. After all, he's not an engineer himself and is in no position to judge whether you have written a complete report or not.
d. Go directly to the client and inform him of the lawyer's intention to bilk him of addition money.
e. Go along with the lawyer this time, but tell him that in the future you will charge a flat fee that will include all aspects of the report.
Ethical Problem Solving in Engineering
By William J. Frey, José A. Cruz, and Halley D. Sanchez
(Cases come from NSF SBR-9810253 or UPRM ABET Ethics Workshops)

Directions: Read the scenario and the suggested solutions that follow it. Then choose the course of action that you think best solves the problem raised. Or, if you find none of the solutions proposed adequate, design your own solution.

1. An industrial engineering student from a small town has started working in his first job as a member of a research and development team charged with designing a new generation of printers for a market leader in this area. The company he works for wants to maintain its leadership in this area. They also want to respond to the emerging environmental problem caused by the disposal of the inkjet cartridges used in their current model. These inkjet cartridges are made in his hometown. If the new generation of printers does not use disposable cartridges, then the plant in his hometown will close, putting friends and family out of work. His company is a leader in empowering its employees. But what should he do with this newly found power?
   a. Resign from the research and development team because he has a conflict of interest.
   b. Use his position and influence on the committee to argue that the company does not need to develop a new generation of printers; the current model will do just fine. In this way he will ensure that his hometown friends will keep their jobs.
   c. Sit back and see what the senior members of the team want to do. Then when he finds out, enthusiastically embrace whatever they recommend.
   d. Advocate designing a recyclable cartridge that could be manufactured in the hometown plant.

2. You work for a construction company that is bidding for a lucrative contract. You are responsible for submitting the bid. Your supervisor tells you to prepare a bid below the actual cost of the project. When you ask how the company plans to recover its costs, your supervisor tells you to introduce mistakes into the constructions drawings. In this way, the company can recover costs by means of costly change orders. When you express discomfort with this, your supervisor dismisses your concerns. "Everybody does it. If we don't, we will lose the bid and we need this contract." What should you do?
   a. Do exactly as your supervisor asks. After all, you are new to the company and don't want to make waves.
   b. Tell your supervisor that under no circumstances will you do what he has asked. Furthermore, if he persists, tell him that you will make a formal complaint to the government's ethics ombudsman.
   c. Tell your supervisor that you will do what he asks only if he puts his order in writing and explicitly relieves you of all responsibility for it. If things go wrong, you want to be able to prove that you were merely following orders.
   d. Quit your job and look for work in a sector that doesn't condone such practices.
   e. Suggest to your supervisor that you contact the potential client and express your suspicions that other companies are deliberately inserting errors into their bids to generate expensive change orders.

3. A UPRM coop student notices that workers who use catalyst A in a manufacturing process habitually violate safety protocols. She finds this disturbing since she knows that A causes cancer. During a meeting of her work group, she expresses her concerns and recommends that they switch to catalyst B which is non-carcinogenic. The leader of the group, a senior engineer, tells her to drop the issue. Because the workers are violating safety procedures, they are responsible for whatever harm may occur, not the company. Furthermore, he has already looked into catalyst B, and it is much more expensive to use than A. What should the coop student do?
   a. Do nothing. As the team leader has pointed out, this is not really her concern.
   b. Point out that as an engineer she is committed to uphold the code of ethics which states that public safety is of paramount concern. If they continue to use catalyst A, they must inform the workers of its carcinogenic properties and of the availability of safer alternatives such as catalyst B. To do anything less is to violate a fundamental professional moral imperative.
   c. Discuss the issue with her faculty advisor at UPRM and ask for advice.
   d. Since this is clearly a public safety issue (worker safety), and since public safety is paramount, the student should go to the nearest television station and blow the whistle on her employer.
e. Investigate the issue further on her own time. Document the danger of catalyst A and carefully examine if catalyst B is really more expensive all things considered.
f. Discuss the issue with human resources department or with the supervisor of the manufacturing process to see if there is any way to enforce better the safety procedures.

4. An engineer notices a fine white powder that covers everything in a room that has a laminating press. When she finds out that the press operator has been working in this room for over 10 years, she becomes concerned about the risks the white powder could present to his health. What should she do?
a. Do nothing. Notifying the worker of the risk could raise legal problems. And should you notify your supervisor (or the worker's supervisor) you raise the probability that they would shoot the messenger rather than respond to the message.
b. Go to the nearest television station and talk with a reporter about this deplorable situation.
c. Check into OSHA regulations concerning the powder. Should the regulations warrant it, notify OSHA of the problem. Then, through appropriate company channels notify the operator and make sure that he receives a thorough medical examination to determine if any harm has occurred. Then check to make sure that the appropriate follow-up examinations are carried out.
d. Take a confrontational stance. Threaten to blow the whistle publicly on this situation unless supervisors take immediate action.

5. A worker under your supervision has recently been fired for incompetence and repeated violations of confidentiality. Several weeks later, the worker returns to you asking for a letter of recommendation. He says you owe it to him; you fired him, and he has not been able to find any work and has a family to support. What should you do?
a. Write the letter praising him in the highest terms. Otherwise you would be responsible for any harm that would come to his family.
b. Write the letter but only after making it clear to him that your letter would have to raise and discuss frankly his being fired.
c. Decline to write the letter. Explain to him that you have a legal duty to be forthright in any such letter to possible, future employers; any deception or omission would render you legally liable. This would render it impossible for you to recommend him in a favorable light.
d. Try to delegate the problem to someone else.

6. Your company has decided to accept your recommendation to purchase a UV curing oven to increase productivity. When the oven has been delivered and readied for use, your supervisor asks you to begin using it even though the appropriate Environmental Quality Board permits have not yet been issued. He states that such permission is pro forma anyway so why wait and lose valuable production time. What should you do?
a. Do what your supervisor asks. The permits should arrive in a couple of weeks. In the meantime, nobody cares if you use the oven temporarily without the permits.
b. Refuse to do it. Running the oven without a permit is illegal, and you are under no obligation to do anything illegal for your employer. Threaten to blow the whistle on him.
c. First try to reason with him. Explain that even though you will probably not get caught, the severity of the fine and the loss of the company's good reputation with the EQB are not worth the risk. Add that as an engineer, you have a special obligation to safeguard the environment which includes strictly conforming to government environmental regulations.
d. Resign from the company or ask to be assigned to a new division with a different supervisor.

7. A civil engineer working for the AAA, while driving through a town in Puerto Rico, notices that a storage tank full of chlorine gas is located dangerously close to a crowded urbanization. Upon further inquiry, he finds that the tank belongs to a local, privately owned industry. When he discusses this problem with local government authorities, they tell him that there is nothing they can do. They wonder why he is so concerned with something that is not a part of his job. What should he do?
a. Nothing. He is a civil engineer, and this is outside his area of expertise.
b. He should drive to the local radio station and demand that they broadcast a warning to the residents of the urbanization. Then they can take collective action against the private company.
c. He could continue working through government channels. After further documenting his concerns, he could bring them to the attention of the EQB, EPA, or OSHA.
d. Go the owners of the tank and try to persuade them to relocate it. If they refuse, he could threaten to blow the whistle on them to the government or the local press.

8. Your company has recently entered into a cooperative venture with a Japanese firm. A team of engineers from this firm has come to your plant to teach your engineers a new manufacturing process. However, a member of this team, a Japanese engineer with very traditional cultural views, refuses to work with your team because one of the members is a woman. He persists even though you tell him that she is a highly qualified engineer. What should you do?
a. Reassign the woman engineer. Explain to her that it is in the best interests of the company that they not offend the cultural sensitivities of the Japanese team.
b. Tell the Japanese engineer that he must work with all the members of your team or go back home.
c. Try to reason with the Japanese engineer by telling that in your culture women are highly qualified and work side by side with men. If this doesn't work, discuss the issue with another member of the Japanese team asking him to convince the Japanese engineer that it would be a good idea to work with the whole team including the woman.
d. Contact the supervisors of the engineers back in Japan and have them send a different team that is better prepared to deal with matters specific to Puerto Rican culture.

9. A student takes a computer systems class in which she learns how to deal with computer viruses. Using what she has learned, she creates her own virus and contemplates releasing it into the University system. Her plan is well intentioned enough: she wants to test the University's virus detection system. If the system picks up the virus, then this proves that it is sound. If not, then the virus will enter the system but since it is fairly harmless—or so she believes—it will eventually be detected without doing any harm, dramatizing to the University that its virus detection system has some weaknesses. Either way, she believes, she will do some good. You are her friend, and she tells you of her intentions. What should you do?
a. Tell her to go ahead. She'll be doing the University a favor.
b. Go immediately to the instructor of the computer systems class and tell him of your friend's intention.
c. Try to talk her out of introducing the virus. Point out that it violates University regulations, that she could be severely punished, and that others with similarly benign intentions have wreaked havoc on computer systems.
d. Anonymously inform the system administrator that someone (don't specify who) plans on introducing a virus into the system. Maybe they can stop your friend, and, because you don't reveal her identity, they will be unable to punish her.
Directions:
(1) Read the following scenarios and the accompanying solutions.
(2) Evaluate the solutions in terms of the ethics tests (reversibility, publicity, harm, and code) and the feasibility test.
(3) Assign each solution alternative a number based on the following scale:

   +10 = outstanding solution that optimizes both the ethics and feasibility tests
   0 = a neutral solution, that is, one that is neither outstanding nor disastrous
   -10 = a disastrous solution, both from the standpoint of the ethics tests and the feasibility tests

(4) Choose the solution you think best (or design your own solution).
(5) Provide a justification showing that the solution you have chosen is the best available alternative given the requirements specified in the ethics and feasibility tests given just below.

REVERSIBILITY: Would I think this is a good choice if I were among those affected by it?
PUBLICITY: Would I want this action published in the newspaper?
HARM: Does this action do less harm than any available alternatives?
CODE TEST: Does the solution alternative carry out or violate any code provisions?
FEASIBILITY: Can this solution be implemented given time, technical, economic, legal, and political constraints?

1. Therac-25 Scenario (From computingcases.com)
   You are a service engineer who works for CMC, the company that manufactures and sells the Therac-25 machine that administers doses of radiation to cancer patients to kill cancer cells. Your supervisor asks you to investigate a Therac-25 unit in a hospital in Hamilton, Ontario. According to the hospital physicist, this unit has administered a massive overdose to a patient.

   The designers claim that overdose is impossible. Nevertheless, you examine the unit at the Hamilton hospital. In spite of several attempts, you are unable to duplicate the accident the operator claims has occurred. You return to CMC, and your supervisor strongly recommends the following course of action:

   "I suspect that the overdose is attributable to operator error. But we don't want to get involved in a blame game. I want you to write a report with two parts: first, inform them that we have redesigned the micro switch and that this improves the safety of the machine by a factor of five; second, with this safety improvement, we can remove the recommendation that operators manually check the hardware setting. I am convinced that the problem—if there is one—is due to operator error. It can't be the software since the same software was used in the earlier Therac models, and there were no software problems with these models."

What should you do?

a. Do what your supervisor says. Also, make it clear that the change you recommend (redesigning the micro switch) did not cause the accident—if one did, indeed, occur. Rather it is a way of preventing errors produced by the operators.
b. Oppose your supervisor. Tell him that he has no right to tell you what to include in your report. Add that you are recommending notifying all customers that they must stop using the machine until you can get to the bottom of this problem.
c. Recommend further tests. Also contact other Therac-25 operators to see if they have had problems similar to those reported at the Hamilton hospital.
d. Resign from CMC and find a job where you won't have to make such difficult decisions.
e. Your solution…
2. Sanchez Scenario (From computingcases.com)

You are the systems administrator at Macondo University. Several students have come to you showing you a threatening email message they have received from an unknown sender. The message singles out Oriental students and threatens to kill them if they don't immediately withdraw from the university.

By examining the heading of the message, you are able to determine that it was sent from a computer lab just down the hall. You go to the hall and find a student in the process of sending another similar email. What should you do?

a. Suggest to the student that it is in bad taste to send such messages over the university's system. But it is important to deal with this situation delicately because you must balance the student's rights against those of the students who have received his threats.
b. Call the campus police and have them take the student immediately into custody since he has threatened several students with death.
c. Confront the student with the evidence you have that he sent the message. Make sure you have all the information necessary to re-contact the student: name, residence, phone, parents' address, etc. Then bring the matter to the university's discipline board. The chances are they will expel the student.
d. Resign.
e. Your solution…

3. Hughes Aircraft Scenario 1 (From computingcases.com)

You work for a company that makes computer chips for the US military for use in fighter aircraft, air-to-air missiles, and tanks. You supervise a team that subjects these chips to rigorous environmental tests.

One of the workers under your supervision comes to you and tells you that an individual at the supervisory level has ordered her to pass chips without testing them. (His reason is that certain chips—called "hot chips"—are behind schedule and customers are clamoring for them.) What should you do?

a. If your supervisor wants to pass chips without tests, then that is his prerogative; you should not oppose this. But, since this is illegal and could have bad consequences should one of the chips fail, you should take steps to protect yourself. He should provide you and the workers under your supervision with a written statement that this action is being undertaken under his orders and that you are not responsible.
b. Immediately blow the whistle by going to the press or to the US military. Passing these chips without proper testing could produce dire consequences, and you don't want to play any part in such a travesty.
c. Go to the supervisor in question and see if you can't persuade him to change his mind. Suggest that he go to the client and explain that testing chips takes more time than manufacturing them. See if you can give priority to testing certain chips—the so-called "hot chips"—to solve the short-term problems associated with delayed shipments.
d. Resign and find a new job with moral supervisors.
e. Your solution…

4. Hughes Aircraft Scenario 2 (From computingcases.com)

You are a supervisor at a company that manufactures computer chips for the US military for use in fighter aircraft, air-to-air missiles, and tanks. You find out that the general supervisor in charge of the environmental testing area has been passing computer chips without proper environmental tests. This is against the law—and clearly against the wishes of the client—but it is the general supervisor's response to the fact that the testing has put the company way behind its manufacturing and shipping schedule. What should you do?

a. You can look the other way and allow the general supervisor to continue passing the chips without properly testing them.
b. You can call the general supervisor to task for passing the chips without proper tests and demand that he carry out these tests no matter how long it takes. You can offer to back up this supervisor when he is called to task for shipping the chips behind schedule.
c. You can minimize the harm and risk by telling him which chips it is dangerous to allow to pass and which can be passed—and perhaps fail—without serious consequences.
d. You can resign.
e. Your solution…

5. A Virtual Rape (From Deborah Johnson, *Computer Ethics*, 168-9)
One night in March of 199x, a character, Bungle, entered LambdaMOO, "a multi-user dimension (MUD) object oriented program." Bungle had designed a subprogram, Voodoo doll, which could attribute actions to other characters. Using the voodoo doll subprogram, Bungle took control of two other characters, Legba and Starspinner, and proceeded to ascribe sadistic actions to them. Legba and Starspinner were helpless throughout the entire incident. The episode ended when another character, Zippy, used a subprogram to freeze Bungle's commands. What should be done to Bungle?

a. Nothing should be done. These kinds of incidents are inevitable in cyberspace, and no real harm has been done. If one tries to restrict actions in cyberspace, then one is depriving people of their freedom of expression.
b. Bungle should be "toaded," that is, his account with LambdaMOO should be removed.
c. Since there were no rules in LambdaMOO, it would be unjust to punish Bungle. After all he has done nothing wrong because he has broken no rules.
d. The programmers (or wizards) cannot punish Bungle this time. But they develop and implement rules to prevent this from happening again.
e. The users of LambdaMOO should discuss this incident in a public forum. Then, collectively, they should decide whether to take measures to prevent this from happening in the future.
f. Your solution…

6. ABC Hardware (From NSF SBR-9810253)
You are a computer programmer working for X, a small company that is currently reengineering the inventory system of a local hardware store, ABC. (ABC would like to use a "just in time" strategy to reduce their inventory and storage costs.) You know of a software program developed by another company which X has a license to use. This license does not allow you to duplicate the program, but your supervisor orders you to install it on ABC's computer. After all, he says, "Who's going to know? We want to keep a valued customer." What should you do? (UPRM NSF ethics initiative)

a. Install the program on ABC's computers. After all, your supervisor is right. Nobody will know. Furthermore, you have only been working for X for six months, and you don't want to be branded a "trouble-maker."
b. Refuse to do it. Make it clear to your supervisor that he is putting you in a very difficult position, and you are not happy about it.
c. Go ahead and install the software on ABC's computers. But be sure to cover yourself by writing a memo that clearly states the illegality of this act. State also that you are doing this only because you have been ordered to do it. Then make sure to give copies to several people.
d. Discuss your problem with another colleague, preferably another supervisor at a higher level than your boss. If this person sympathizes with your situation, then ask him or her to go with you, meet with your boss, and try to talk him out of this course of action.
e. Your solution…

7. Rave Case (From DOLCE summer 2000 workshop)
Joe is working his way through college. He receives an offer from some friends to work in a start-up company that will organize and host raves. Because Joe has some experience with programming on the Web, they ask him to set up the Web site to advertise the raves. Joe accepts, and soon the company has more business than it can handle. However, the community's reaction to raves has been negative; "ravers" often use Ecstasy and other recreational drugs. What should Joe do?
Joe should continue doing what he has been doing since the company is successful. He cannot be held responsible for what people do at the raves since this is beyond his control. All he is doing is putting his technical expertise to a profitable use.

b. Joe should continue to advertise raves but make it clear that he will do the advertising only for drug free raves.

c. Joe should continue this work in the short term but start looking for another job.

d. Joe should try to open a dialogue with those who oppose raves, discuss their concerns, and see if together they can reach a compromise agreement.

e. Your solution…

8. Credit Cards for College Students (From DOLCE workshop, summer 2000)

Jim has started to work for a large bank that wants to promote the use of credit cards by college students. His task is to develop a software system that would support mass mailings of credit card applications to prospective student users and then process the applications received. Jim is aware that his system will result in many college students using these cards irresponsibly and that their parents will be held responsible for the debts of their children. What should he do?

a. He should ask to be reassigned to another project; this project is immoral. (He could claim that he has a "conflict of interest.")

b. He should continue doing what he has been told to do; that is his job. Should any moral problems arise, they would come from his employer's misuse of what he has provided them. They—not he—would be responsible.

c. He should suggest to the bank that they put together a "focus group" of parents and college students and ask them how they would design this credit card and the supporting software system.

d. He should continue working on the project and monitor its results. If these should prove harmful to the customer, then he should get another job.

e. Your solution…
Rewriting Textbook Exercises for EAC (Ethics-Across-the-Curriculum)

1. Ellerbe Creek receives wastewater from the 10 mgd Northside Wastewater Treatment Plant in Durham, North Carolina. The creek has a mean summertime flow of 0.28 $\text{m}^3/\text{m/s}$. The wastewater characteristics are: temperature $= 28^{\circ}\text{C}$; ultimate BOD (L) $= 40$ mg/L; $k_1 = 0.23 \text{ d}^{-1}$; dissolved oxygen $= 2$ mg/L. The total stream length is 14 miles, at which point it empties into the Neuse River. Should the State of North Carolina be concerned about the effect of this discharge on Ellerbe Creek? Explain and justify. (From Michael Davis, *Ethics in the University*, Chapter 8, 157. Based on a case from Aarne Vesilund, *Introduction to Environmental Engineering*.)

2. The data below are the joint temperatures of the O-rings (degrees F) for each test firing or actual launch of the space shuttle rocket motor (from Presidential Commission on the Space Shuttle Challenger Accident, Vol. 1, pp. 129-131): 84, 49, 61, 40, 83, 67, 45, 66, 70, 69, 80, 58, 68, 60, 67, 75, 61, 72, 73, 70, 81, 76, 79, 75, 76, 58, 31.
(a) Compute the sample mean and sample standard deviation.
(b) Construct a dot diagram of the temperature data.
(c) Set aside the smallest observation (31$^{\circ}\text{F}$) and recompute the quantities in part a. Comment on your findings. How "different" are the other temperatures from this last value?
(d) Evidence from flight 51B on April 29, 1985 showed that "a primary seal eroded in three places over a 1.3 inch length up to a maximum depth of 0.120 inches and the secondary seal in the same joint was eroded 0.032 inches. It was postulated that this primary seal had never sealed during the full two minutes of flight." This, in your opinion, represents a life-threatening situation for the shuttle crew. What should you do?

3. The course syllabus for ININ4010, *Probability and Statistics for Engineers*, says the following on the issues of ethics: "Any academic fraud is subject to the disciplinary sanctions described in article 14 and 16 of the revised General Student Bylaws of the University of Puerto Rico contained in Certification 018-1997-98 of the Board of Trustees."
Discuss the following scenario. A friend of yours has asked to borrow a lab report you prepared for a class you took last semester and he is now taking this semester. You give it to him. Two weeks later you are in his room and discover that he used your report without alteration. What should you do?
(a) Do nothing. The damage is already done. Besides he is your friend and helping him has priority over avoiding academic fraud.
b. Go directly to the instructor and explain what happened.
c. Tell your friend to go to the instructor and explain what happened.
d. Find a new friend.
e. Borrow his lab report for the class you are currently taking.

4. Discuss the relation between 5j in the CIAPR code of ethics and academic fraud.
(5j: No aprobarán, timbrarán, estamparán, o certificarán, según corresponda, ni autorizarán la presentación de planos, especificaciones, cálcules, dictámenes, memorial o informes que no hayan sido elaborados por ellos o bajo su responsabilidad directa. Además, le darán crédito por el trabajo de ingeniería, agrimensura o arquitectura a quienes corresponda.)

5. The University of Virginia has an interesting way of dealing with academic fraud. They have a student honor code. Any violations will lead to immediate suspension. Anyone who has graduated and helps another student commit academic fraud will have his or her degree revoked.
A physics professor has developed a special program to detect repeated phrases and papers. He has found that 123 students are involved in recycling term papers including several who have already graduated. The students are suspended. The former students participating were identified and had their degrees revoked. What do you think about this?
6. Read the Mount Dioxin case. (See Engineering Ethics: Concepts and Cases by Michael Pritchard, Michael Rabins, and Charles Harris, CO-ROM.) How should the EPA site manager respond to EPA requests that he begin excavation before he feels there has been sufficient time to study the health effects of the cleanup and with a budget that is inadequate to carry out the job?

The site manager looks into the feasibility of using a vinyl tarp to cover the toxic material during cleanup. Determine the lift force on the vinyl tarp using the information presented in the case.

### Recognition Stage: Identification and Documentation of Existing Ethics Integration Activities
(Examples: See Assessment form on page 21)

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<tr>
<td>Environmental Engineering, ENG 3___</td>
<td>Assignment of Ellerbe Creek Case (See workshop readings, p. 35)</td>
<td>Ethical awareness</td>
<td>Students formulate ethical problem that is accessed only through numerical calculations.</td>
<td>Assessment of numerical calculations.</td>
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<td>Ethical Evaluation</td>
<td>Students present ethical argument to North Carolina on water discharge.</td>
<td>Assessment of student ethical argument concerning discharge.</td>
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<td>Ethical Integration</td>
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<td>Assessment Technique: General Module Evaluation Form (See p. 22)</td>
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<td>ABET 2000, Criterion 4: integrating environmental issues into design project.</td>
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<tr>
<td>Industrial Engineering, ININ 3___</td>
<td>Discussion of ethics question on PE examination</td>
<td>Ethical Awareness. ABET 2000, 3f: Awareness of ethical and professional issues in engineering.</td>
<td>Improve mean score of UPRM students on ethics questions in relation to US average.</td>
<td>Examination of mean score of UPRM students on professional examination on ethics questions.</td>
</tr>
</tbody>
</table>
**Evaluation – Ethics-Across-The-Curriculum Workshop**

Instructions: Please circle the number which indicates **THE DEGREE TO WHICH YOU AGREE** with each of the following statements.

**KEY:**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>NA (not applicable)</th>
</tr>
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<tbody>
<tr>
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<td></td>
<td>strongly disagree</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>strongly agree</td>
</tr>
</tbody>
</table>

1. The objectives of the sessions were clearly stated.  
2. The objectives proposed were met.  
3. The activities presented were very well organized.  
4. The presenters were well prepared.  
5. The activities provided for active participation of the participants.  
6. Time was managed appropriately throughout the whole activity.  
7. The topics presented were of relevance to my present work.  
8. My expectations were satisfied.  
9. This was a valuable experience.  
10. There was a sense of closure at the end of the session.  
11. I will be able to put into practice the ideas presented.  
12. The session was a valuable learning experience.  
13. The materials provided were useful.  
14. I would like to see an activity like this carried out at my institution.  

Please answer the following questions:

1. Do you expect to put into practice some or all of the idea presented in this session?  
   _____ Yes   _____ No  
   Please explain your answer:  

2. Would you recommend this type of activity to other colleagues?  
   _____ Yes   _____ No  
   To whom?  

3. Suggestions for improvement.  

4. Would this activity work at your institution? Why or why not?