Ethical Decision Making in Today's Engineering Classrooms

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*e*VERY DAY, we make numerous ethical decisions, although most are so minor that we do not even view them as such.

- *When you drive your car, do you knowingly violate the posted speed limit?*
- *When you unload the shopping cart at your car, do you leave it in the middle of the parking lot, or return it to the designated area?*
- *You know that another student has plagiarized an assignment; do you rat him or her out?*
- *A person with a mental disability tries to converse with you while waiting in a public queue. Do you treat him or her with respect or pretend he or she does not exist?*
- *In the grocery store, a teenager's mother tells her to put back the carton of ice cream she brought to the cart. She walks around the corner and places the ice cream on the shelf with the soft drinks. Do you ignore this or approach the teenager and politely explain that leaving the ice cream in that location will cause it to melt and increase the cost of groceries for everyone else, or do you return it to the freezer yourself?*
- *When going through a public door, do you make a habit of looking back to see if releasing the door will cause it to slam in someone's face?*
- *You notice a highway patrolman lying in wait for speeders. Do you flash your lights at other cars to warn them?*
- *A cashier gives you too much change for a purchase. Do you correct the cashier?*
- *You are on the lake in your boat and notice a person on a JetSki chasing a great blue heron across the lake. The skier stops at a nearby pier. Do you approach the skier and reprimand him for harassing the wildlife?*

On a grand scale, none of these decisions is particularly important, although some might lead to undesirable consequences. However, as an aspiring engineer, you may face numerous decisions in your career that could affect the lives and well-being of thousands of people. Just like almost everything else, practice makes perfect, or at least better.

The more you practice analyzing day-to-day decisions from an ethical standpoint, the easier it will be for you to make good decisions when the results of a poor choice may be catastrophic.

In very general terms, there are two reasons people try to make ethical decisions.

- *They wish to make the world a better place for everyone—in a single word, altruism.*
- *They wish to avoid unpleasant consequences, such as fines, incarceration, or loss of job.*

Acceptable Behavior

In an ideal society, the second reason would not exist. However, history is replete with examples of people, and even nations, who do not base their decisions solely on whether or not they are acting ethically. Because of the common occurrence of unethical behavior and the negative impact it has on others, almost all societies have developed rules, codes, and laws to specify what is and is not acceptable behavior, and the punishments that will be meted out when violations occur.

The major religions all have fairly brief codes summarizing how one should conduct their life. Some examples are given below; other examples exist as well.

- *Judaism, Christianity, and derivatives thereof have the Decalogue, or Ten Commandments.*
- *Islam has the Five Pillars in addition to a slightly modified and reorganized form of the Decalogue.*
- *Buddhism has the Noble Eightfold Path.*
- *Baha'i has 12 social principles.*
- *In Hinduism, Grihastha dharma has four goals.*

Secular codes of conduct go back more than four millennia to the Code of Ur-Nammu. Although by today's standards,
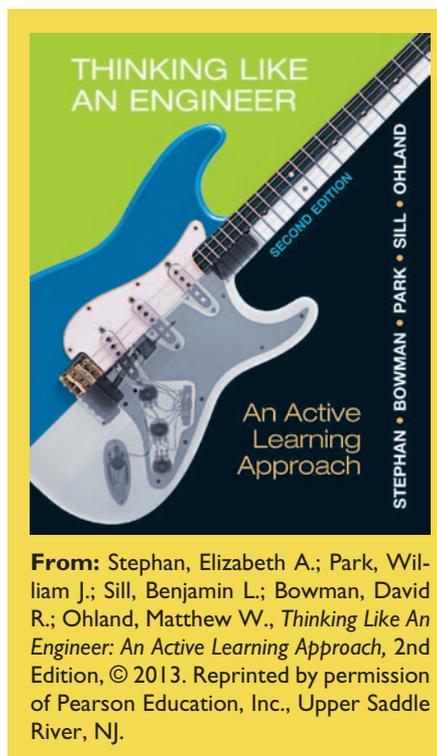
some of the punishments in the earliest codes seem harsh or even barbaric, it was one of the earliest known attempts to codify crimes and corresponding punishments.

Admittedly, although not specifically religious in nature, these codes are usually firmly rooted in the prevailing religious thought of the time and location. Through the centuries, such codes and laws have been expanded, modified, and refined so that most forms of serious antisocial behavior are addressed and consequences for violations specified. These codes exist from a local to a global level. Several examples are given below.

- *Most countries purport to abide by the Geneva Conventions, which govern certain types of conduct on an international scale.*
- *Most countries have national laws concerning murder, rape, theft, etc.*
- *In the United States, it is illegal to purchase alcohol unless you are 21 years of age. In Great Britain, the legal age is 18.*
- *In North and South Dakota, you can obtain a driver's license at age 14 1/2. In most other states, the legal age is 16.*
- *It is illegal to say "Oh, boy!" in Jonesboro, Georgia.*
- *Many cities, such as Santa Fe, New Mexico, have ordinances prohibiting use of cell phones while driving.*

Real-World Decisions
Some ethical decisions are clear-cut. For example, essentially everyone (excluding psychopaths) would agree that it is unethical to kill someone because you do not like his or her hat. Unfortunately, many real-world decisions that we must make are far from "black and white" issues, instead having many subtle nuances that must be considered to arrive at what one believes is the "best" decision.

There is no proven algorithm or set of rules that one can follow to guarantee that the most ethical decision possible is being made in any particular situation. However, numerous people have developed procedures that can guide us in considering questions with ethical

Good people do not need laws to tell them to act responsibly, while bad people will find a way around the laws.—Plato

ramifications. A four-step procedure is discussed here, although there are various other approaches.

Step 1: Determine *What* the issues are and *Who* might be affected by the various alternative courses of action that might be implemented.

We will refer to the *Who* as stakeholders. Note that at this point, we are not trying to determine how the stakeholders will be affected by any particular plan of action.

The issues (What) can refer to a wide variety of things, including, for example, personal freedom, national security, quality of life, economic issues, fairness, and equality.

The term stakeholders (Who) does not necessarily refer to people, but might be an individual, a group of people, an institution, or a natural system, among other things.

Step 2: Consider the effects of alternative courses of action from different perspectives.

Here, we look at three perspectives: consequences, intent, and character.

Consequences
When considering this perspective, ask how the various stakeholders will be affected by each alternative plan being contemplated. In addition, attempt to assign a relative level of importance (weight) to each effect on each stakeholder. For instance, an action that might affect millions of people adversely is almost always more important than an action that would cause an equivalent level of harm to a dozen people.

Intent
The intentions of the person doing the acting or deciding are considered in this perspective, sometimes called the "rights" perspective. Since actions based on good intentions can sometimes yield bad results, and vice versa, the intent perspective avoids this possible pitfall by not considering the outcome at all, only the intentions.

It may be helpful when considering this perspective to recall Immanuel Kant's Categorical Imperative: "Act only according to that maxim

Excerpts From The Code Of Ur-Nammu

- If a man commits a murder, he must be killed.
- If a man commits a robbery, he will be killed.
- If a man commits a kidnapping, he is to be imprisoned and pay 15 shekels of silver.
- If a man knocks out the eye of another man, he shall weigh out half a mina of Sliver.
- If a man has cut off another man's foot, he is to pay 10 shekels of silver.
- If someone severed the nose of another man with a copper knife, he must pay two-thirds of a mina of silver.
- If a man knocks out a tooth of another man, he shall pay 2 shekels of silver.

Ethical Decision Making in Practice

Your company has been granted a contract to develop the next generation of electronic cigarette, also known as a "nicotine delivery system," and you have been assigned to the design team. Can you in good conscience contribute your expertise to this project?

Step 1: Identify the issues (What) and the stakeholders (Who).

Issues:
- Nicotine is poisonous and addictive.
- These devices eliminate many of the harmful components of tobacco smoke.
- Laws concerning these devices range from completely legal, to classification as a medical device, to banned, depending on the country.
- There are claims that such devices can help wean tobacco addicts off nicotine.
- The World Health Organization does not consider this an effective means to stop smoking.
- Whether an individual chooses to use nicotine should be a personal decision, since its use does not generally degrade a person's function in society.
- The carrier of the nicotine (SQ-90% of the total inhaled product) is propylene glycol, which is relatively safe, but can cause skin and eye irritation, as well as other adverse effects in doses much larger than would be obtained from this device.
- A profit can be made from nicotine products or anti-smoking devices.

Stakeholders:
- You (your job and promotions)
- Your company and stockholders (profit)
- Cigarette manufacturers and their employees and stockholders (lost revenue)
- Tobacco farmers (less demand)
- The public (less second-hand smoke)
- The user (various health effects, possibly positive or negative)

Step 2: Analyze alternative courses of action from different perspectives.

1. Consequences
- You may lose your job or promotion if you refuse.
- If you convince management to abandon the project, the company may lose money.
- If you succeed brilliantly, your company may make money hand over fist, and you receive a promotion and a raise.
- If the project goes ahead, the possibility of future lawsuits exists.
- Users' health may be damaged.
- Users' dependence on nicotine may either increase or decrease.

2. Intent
- Should everyone use electronic cigarettes, or at least condone their use?
- Should use of electronic cigarettes be unrestricted by law?
- Would/like to risk nicotine addiction because of using these devices?
- Would I be able to kick my tobacco habit by using these devices?

3. Character
- Would a person of good character develop this device, use it, or condone its use?
- Would work on this project (thus implicitly condoning its use) or use of the device itself enhance or degrade my character?
- Would my personal spiritual leader, or other person I revere, condone development or use of this product?

Step 3: Correlate perspectives.
Here we enter the realm of subjective judgment. The individual author responsible for this example has a definite personal answer, but it is in the nature of ethical decision making that different people will often arrive at different results in good conscience. You would have to weigh the factors identified from the different perspectives (including any that have been overlooked or knowingly omitted) to arrive at your own conclusion. We refuse to dictate a decision to you.

Step 4: Act on your decision.
If your decision was that working on this project poses no threat to your soul (if you happen to believe in such), probably little courage is required to follow through, since your career may blossom, or at least not be curtailed. On the other hand, if you believe that the project is unethical, you need to have the intestinal fortitude to either attempt to change the minds of management or refuse to work on the project, both of which may put your career at risk.

whereby you can, at the same time, will that it should become a universal law." To pull this out of the eighteenth century, ask yourself the following questions:

(a) Is the action I am taking something that I believe everyone should do?
(b) Do I believe that this sort of behavior should be codified in law?
(c) Would I like to be on the receiving end (the victim) of this action?

Character

Character is the inherent complex of attributes that determines a person's moral and ethical actions and reactions. This perspective considers the character of a person who takes the action under consideration. There are different ways of thinking about this. One is to simply ask: Would a person of good character do this? Another is to ask: If I do this, does it enhance or degrade my character? Yet another way is to ask yourself if a person you revere as a person of unimpeachable character (whoever that might be) would take this action.

Step 3: Correlate perspectives.
Now look back at the results of considering the issues from the three perspectives. In many cases, all three perspectives will lead to the same or a similar conclusion. When this oc-

curs, you have a high level of confidence that the indicated action is the best choice from an ethical standpoint.

If the three perspectives do not agree, you may wish to reconsider the question. It may be helpful to discuss the issue with people whom you have not previously consulted in this matter. Did you omit any factors? For complicated issues, it is difficult to make sure you have included all possible stakeholders and consequences. Did you properly assign weights to the various aspects? Upon reconsideration, all three perspectives may converge.

If you cannot obtain convergence of all three perspectives, no matter how hard you try to make sure you left nothing out, then go with two out of three.

Step 4: Act.
This is often the hardest step of all to take, since ethical action often requires courage. The whistle-blower who risks losing his or her job, Harriet Tubman repeatedly risking her life to lead slaves to freedom via the Underground Railroad, the elected official standing up for what she knows to be right even though it will probably cost her the next election, or even something as mundane as risking the ridicule of your friends because you refuse to go along with whatever questionable activities they are engaging in for "fun." Ask yourself the question: "Do I have the courage to do what I know is right?"

Plagiarism

You probably know what plagiarism is—claiming someone else's work as your own. This is most often used in reference to written words, but may be extended to other media as well. From a legal standpoint, plagiarism per se is not illegal, although it is widely considered unethical. However, if the plagiarism also involves copyright infringement, then this would be a violation of the law. Certainly, in the context of your role as a student, plagiarism is almost universally regarded as academic dishonesty, and subject to whatever punitive actions your school deems appropriate.

In some cases plagiarism is obvious as when an essay submitted by a student is almost identical to one found on the Internet, or is the same as that submitted by another student. It is amazing how frequently students are caught cheating because they copied verbatim from another student's work, complete with strange mistakes and bizarre phrasing that grab the grader's attention like an 18-wheeler loaded with live pigs locking its brakes at 80 miles per hour. (Thanks to Gilbert Shelton for that image.)

Far Less Clear

In other cases, things are far less clear. For example, if you were writing a short story for your English class and used the simile "her lips were like faded tulips, dull and wrinkled," can you (or the professor) really be sure whether that was an original phrase or if you had read it at some time in the past, and your brain dragged it up from your subconscious memory as though it were your own?

We all hear or read things during our lives that hang around in our brains whether we are consciously aware

of them or not. We cannot go through life in fear of being accused of plagiarism because our brain might drag up old data masquerading as our own original thought, or even worrying about whether our own original thoughts have ever been concocted by another person completely independently.

Problems That Arise

Any reasonable person (although admittedly, there is a surfeit of unreasonable people) will take the work as a whole into account. If there is simply a single phrase or a couple of instances of wordings that are similar to another source, this is most likely an innocent coincidence. On the other hand, if a work has many such occurrences, the probability that the infractions are innocent is quite low.

We arrive here at intent. Did you knowingly copy part of someone else's work and submit it as your own without giving proper credit? If you did not, stop worrying about it. If you did, Big Brother, also known as your professor, is watching, possibly with the assistance of high-tech pla-

giarism detection tools. (A tip of the hat to George Orwell.)

Ethical decisions in engineering have, in general, a narrow focus specific to the problems that arise when designing and producing products or services of a technical nature. Engineers and scientists have, by the very nature of their profession, a body of specialized knowledge that is understood only vaguely, if at all, by most of the population. This knowledge can be used for tremendous good in society, but can also cause untold mischief when used by unscrupulous practitioners.

Various engineering organizations have thus developed codes of conduct specific to the profession. Perhaps the most well known is the Code of Ethics for Engineers developed by the National Society of Professional Engineers (NSPE).

The entire NSPE Code of Ethics is rather long, so we included only the Engineer's Creed and the Fundamental Canons of the Code in this article. Read the complete code at *http://www.nspe.org/Ethics/CodeofEthics/index.html*.

He recently accepted a position with Jobscope, an Engineer-to-Order ERP software company based in Greenville, SC, in mobile application development.

Dr. William J. Park, left, has been an associate professor at Clemson University, teaching in the General Engineering Program since the fall of 1992.

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Dr. Elizabeth A. Stephan, *Ohio Kappa '93*, at right, joined the faculty at Clemson University in January 2002 in the General Engineering Program, assuming the role of Director of the program from August 2007 – December 2010. Beth has served as a District Director since 1996 and is the chief advisor to South Carolina Alpha.

David R. Bowman, center, taught in the General Engineering Program from January 2006 to November 2011.

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