Work in Progress – Establishing a Foundation For Engineering Ethics

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Abstract - Ethics can be taught from different perspectives. In a public institution the instructor appeals to behaviors that promote the common good. In a private institution engineering ethics can be rooted in the values shared by the supporting community. In this paper the foundation of engineering ethics is explored to show a logical connection between these two perspectives and to formulate corresponding strategies for teaching. The goal is to approach ethical concerns in engineering objectively while transcending sectarian bias and speaking to mainstream culture.

Index Terms - Code of ethics, Engineering ethics, Research ethics.

INTRODUCTION

What is meant by the concept of behaving ethically with regard to some accepted standards? Does it have to do with feelings, religious beliefs, or respect for laws and standards established by individuals or groups and, consequently, relative to their interests and values? Or does it have to do with an objective system of values and moral code inherent to humankind? British author C. S. Lewis argued that if the professional doesn’t start with a commitment to ethical feelings, religious beliefs, or respect for laws and standards regard to some accepted standards? Does it have to do with some aspects of this dynamic, much of what Lewis describes can be seen taking place in the world today.

As ethics is taught across the curriculum [2], how does the instructor establish a foundation for making choices where there are serious ethical demands? How do instructors teach ethics to a broad spectrum of students? Does engineering ethics have absolute standards or are they merely cultural constructs to achieve pragmatic objectives?

In the National Society of Professional Engineers “Code of Ethics for Engineers” [3], engineers are bound to “hold paramount the safety, health, and welfare of the public.” Are these principles rooted in the relative terms of economics and culture or in the absolute terms of the value of a human life? Engineers are bound to “perform services only in areas of their competence.” Competence can be viewed in a relative, legal sense or in the sense of concrete knowledge and experience. The latter perspective speaks of an absolute standard. The engineer is also only to “issue public statements in an objective and truthful manner.” If the ethical standard is relative, we concern ourselves with legal liabilities. If the standard is absolute, we go beyond liability to responsibility.

THE CHALLENGE OF TEACHING ETHICS

More and more the role of ethics in complex multidisciplinary engineering becomes paramount as new and unexpected situations regarding, for example, the reengineering of the human genome arise. Engineers might neglect ethical issues by assuming that their role is limited to the technological side of the project. The engineer becomes a technician who plays a very small part in the greater scheme of things. Can students be challenged to find a more significant role than this in their future careers as engineers?

In C. S. Lewis’ novel That Hideous Strength [4], the “National Institute of Coordinated Experiments” (NICE) is in charge of solving all sorts of social and genetic problems without being bothered by “red tape.” Mark Studdock is a member of the team who must continually suppress his natural instincts as he moves from the merely vulgar to the unethical and then to the criminal. Although the novel exaggerates some aspects of this dynamic, much of what Lewis describes can be seen taking place in the world today.

How and why should the engineer behave ethically? In Abolition of Man [1] Lewis further argues that there is an inherent instinct to behave ethically. The engineer may feel the impulse to denounce a wrong action by a company because its engineers are not following proper engineering procedures or, for example, are breaking environmental laws. That same engineer might feel like keeping quiet to protect his or her job as an act of self-preservation. There seems to be another factor that moves some engineers to ignore the need for self-preservation and to follow the impulse to act ethically. From the perspective of some religious traditions, this impulse is rooted in what is the essence of being human. For others, this might be described as an attraction to a higher road of human conduct that is congruent with the former.

ENGINEERING ETHICS

How do we put the above perspectives into practice in engineering education? An engineering course might deal with the obligations of an engineer to the client or employing company. Ethical questions can be discussed openly. One approach is to search for common ground in social or religious values. An engineering ethics course can investigate professional ethics as seen from religious, personal, or legal perspectives. We also can draw on professional ethics for

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insight on ethical problem resolution. Harris, Pritchard, and Rabins point out important problems in professional ethics and the range of choices available in dealing with such problems [5]. The ethical challenges that are presented in an engineering course can be dealt with through thoughtful consideration of principles adhered to within various religious traditions or as experienced in human history. An analysis of the underlying principles inherent in research ethics and engineering codes of ethics suggests some standards for the foundation of engineering ethics.

**RESEARCH ETHICS AND ENGINEERING CODES OF ETHICS**

National Science Foundation (NSF) statements on research ethics are rooted in what are commonly accepted as ethical practices among researchers [6]. There appears to be an underlying assumption that the way most researchers behave is the standard. In engineering codes of ethics, there are general and specific instructions for the engineer. There is an underlying assumption that the code writer(s) knew what the appropriate behavior was.

NSF policies and engineering codes of ethics assume that human nature is such that the majority will not, over time, behave unethically in order to survive. Also, it is assumed that a violation of these policies or codes is an abnormality. Furthermore, the research enterprise or the engineering profession will correct itself when challenged by violators. Ethics violations are short-term aberrations. This seems to presuppose that this is a moral or, at least, a rational universe.

**DISCUSSING ETHICS WITH STUDENTS**

There are many issues in contemporary life that can be used to initiate discussions of ethics in the classroom. Consider the conflicts over abortion, political values (liberal versus conservative), rich versus poor, war and peace, etc. The conflict over abortion proves that reproduction is important. The same is true for other conflicts: politics proves that the right to vote is important. Ethics violations are short-term aberrations. This seems to presuppose that this is a moral or, at least, a rational universe.

Applying this to engineering, consider the following ethical principles commonly agreed to in engineering:

- A product should perform its intended function.
- A functioning product should have a statistically predictable lifetime.
- A product should not have dangerous “side effects.” It should not be toxic to the environment, the producer, or the user.
- A product should produce a reasonable income for the producer.
- A product that is a grave necessity to every human should be accessible at reasonable cost.

There are absolute standards or principles in engineering ethics. However, these principles require a human understanding and application that can lead to what can be called “shades of disagreement.” We might agree that product safety is essential, but we might disagree as to what product safety means. The controversy argues for the existence of the absolute. Some standards in engineering are established by professional agreements. In ethics, an absolute is the requirement for the producer to use these standards if he or she claims to be using these standards.

In producing new devices and technologies, engineering creates situations that make its practice vulnerable to ethical relativism or ambivalence, since new technologies emerge whose human impact is unknown. Over time, absolutes do emerge. Students are ready, for example, to discuss nuclear weapons. The use of weapons of mass destruction by civilized societies has occurred, but to a limited extent. Today no civilized society would use such weapons willy-nilly. This insight did not come overnight, but through experience and reflection.

**CONCLUSION**

There are issues that are crucial to human life and the practice of engineering. Most engineers try to practice engineering at a high standard. Most students respond to instruction in engineering ethics. For those whose commitment is based on important life principles, the response might be sooner and more vigorous. For others the response should come, but perhaps at a different rate and intensity. A careful analysis of fundamental principles in engineering ethics should make ethics education more effective.

Thus, teaching engineering ethics at a public university or at a private (religious) institution requires the understanding that there are fundamental principles and values for human conduct which transcend the local community social-cultural and specific technical conditions. Particular worldviews of different communities may provide a deeper and specific ethical understanding of moral principles; however, everyone can come to this understanding through human reason. The ability to follow such principles and the propensity to fail them is beyond the scope of this paper.

**REFERENCES**