Efficacy of Teaching Professional Engineering Ethics to Engineering Students

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Abstract

While real life instances showing poor ethical behavior in decisions made by engineers or corporation managers appear periodically in the news headlines, it is unclear that teaching ethics to engineering students will in fact change or the influence the personal behavior, beliefs, or actions of engineers and corporate managers at critical junctures. The current public and professional call for the perceived need of ethics training in engineering and business professional degree requirements has most likely arisen from unethical actions in well-known and well-publicized cases, with their effect on accreditation bodies and education stakeholders. This manuscript reviews current research for ethics training in engineering and business curricula and the impact on the behaviors of graduates. Existing ethics training and outcomes of other professions such as business, law, and medicine can be examined to glean what engineering educators might realistically expect as graduate engineering outcomes. This manuscript focuses on existing ethics education efforts and outcomes of business schools and its efficacy as potential indicator of graduate engineer outcomes.

Keywords

Professional, Engineering, Ethics.

Introduction

Worldwide news stories highlighting the ethical failures of business/engineering decisions have put pressure on educational accreditation boards to require higher education institutions to introduce courses in business/professional ethics and corporate social responsibility[1]. ABET, Incorporated, (formerly known as the Accreditation Board for Engineering and Technology prior to 2005) is the organization that accredits college and university programs in applied and natural science, computing, engineering and engineering technology. ABET initiated their engineering ethics requirement with Engineering Criteria 2000. Under the 2019-2020 revision to Criterion 3, Student Outcome 4, ABET states the following as a desired graduate engineer outcome[2]:

"an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts"

Ethics may be defined as a set of knowledge in terms of moral principles and adhering to them. Ethical behavior is generally moral as "good" and "right" as compared to "bad" or "wrong" in a situation. Engineering or business professional ethics tend to be combination of good moral common sense combined with law. It is doubtful that most unethical engineering or business decisions were unknown to be unethical when made. In fact the literature shows that

organizational behavior and performance outcomes can override personal ethics. Changing or building strong ethical character in professional practice can be difficult.

It is unfathomable that a student will arrive on a college campus without having learned the basics of personal ethical behavior. Although, should such a student arrive without ethics or with poor ethical judgment it is unclear that this can this be corrected, especially via a single college course or two. Yet, ethics can be taught and learned. However, it is not apparent whether the ethics education imparted to students will be internally embraced and supported by practicing engineers or business managers in a critical decision. The ultimate outcome of teaching ethics to students is that engineering graduates will review their professional decisions with respect to ethics and avoid poor ethical choices.

The requirement of teaching of professional ethics is either already present or rapidly entering engineering curriculums. In many instances this is via a stand-alone course to satisfy a requirement of an education accreditation body. The call for ethics/professionalism training/education may be the result of highly publicized cases appearing regularly in the news. Recent examples include Volkswagen emission software cheating scandal (sometimes referred to as "Dieselgate"), General Motors continued use of faulty ignition switches, or the Boeing 737 Max faulty control software. Quite possibly people may currently be more aware poor business/engineering judgement as news and social media have become intertwined and widely distributed in recent years.

The driving forces behind an increased effort to include ethics education in engineering curricula appear to be public outrage and demands of an accreditation board.

Professional Ethics Defined

While there are similarities between personal ethics and professional ethics, it is best to define professional ethics. A professional code of ethics is a set of guidelines designed to set out acceptable behaviors for members of a particular group, association, or profession.

Professional ethics differs from personal ethics. For example, the National Society of Professional Engineers outlines a professional code giving a hierarchy of engineering ethical obligations. Primary is ethical obligations to the public. Secondary is ethical obligations to client or employer. Tertiary is ethical obligations to other professionals and other parties.

Professional standards generally require: 1) formal education, 2) sophisticated skills, use of judgment, exercising discretion, 3) societies or organizations that establish standards for admission to profession and standards of conduct, 4) practice of the profession benefits mankind, looking out for the public's welfare. Clearly engineering fits this description.

Despite the infamous ethical scandals in business/engineering decisions making headlines, engineers are still viewed by the public as highly ethical and trustworthy. Using Gallup polling data Figure 1 shows that Engineers are just behind Nurses, Pharmacists, and Medical Doctors in a recent survey on the public's view of professional honesty and ethical standards. Sixty-five percent (65%) of the survey responders believe engineers are very high or high in honesty and ethical standards. Interestingly, car salespeople and members of Congress are at the bottom. [4]

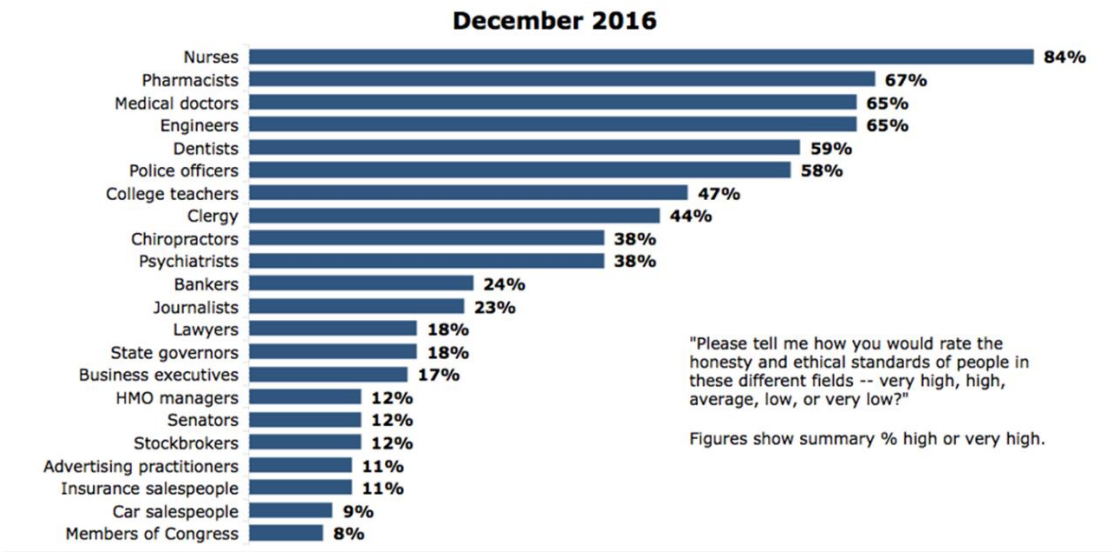

Figure 1. Consumer Views of Honesty and Ethical Standards in professions[4].

Results of Ethics Education

Little is available on the efficacy of ethics education for engineering students. Business as a profession is considered very related and linked to engineering, so the author conjectures that many engineering ethics failures might actually be considered business decision ethical failures. Thus, it was deemed appropriate to review the efficacy of ethics training in business education to gain some possible insight to the efficacy of engineering ethics education.

About 70% of business programs had some form of ethics education by 2013.[5] However, several studies have revealed that a single business ethics course or ethics taught as components of multiple courses yielded no significant change in students ethical attitudes.

It has been shown that the influence of organizational context may weight heavy in a decision with ethical components. In fact it was observed that organizational/performance influences can override personal ethical convictions.[7] While some finding indicate that integrating ethics into a business curriculum is significant and will decrease tolerance for unethical behaviors[9,7]. It was noted that teaching ethics has more positive impact on ethical judgement for younger students than older students. This gives some credence to incorporating ethics early in a professional education. Gender also appeared as significant factor in an ethics education efficacy study. [5]

Another study in Poland revealed the impact of a business ethics/corporate social responsibility (CSR) course was very questionable.[6] This study showed a negative effect of the students' belief in the utility of these courses to solve professional life moral problems. In fact there was a higher student awareness of CSR in students who had not taken the course.

Summary

The research on the efficacy of ethics training in business schools has been mixed and generally inconclusive. Although it appears early ethics training may be more impactful. Clearly, additional research is needed.

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