



## **Integrating Compassion into an Engineering Ethics Course**

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# Integrating a Compassion Practicum into a Biomedical Engineering Ethics Course

## Abstract

A required undergraduate course in the ethics of biomedical engineering has been developed and taught. Students are required to design, successfully accomplish and reflect upon an activity referred to as a *compassion practicum*. The *compassion practicum* sought to begin the development of a critical consciousness in students. Students' projects fall into two categories: (1) a service learning type project which must in some way improve the quality of life of others and involves a minimum of 15 hours of actual service; and (2) a guided, extensive visit of an animal rescue society farm in which students confront animals typically used in biomedical research projects and reflect on the entire experience.

## Introduction

Biomedical engineering is the application of engineering principles and techniques to medicine. It combines expertise in engineering with expertise in medicine and human biology to develop technologies and techniques for healthcare and patient care. As a field, it is very broad, with applications ranging from molecular imaging to the construction of artificial hearts. Biomedical engineering is however narrower in scope than bioengineering, or biological engineering, with which it is sometimes equivocated. Bioengineering focuses on the engineering of biological processes and systems in general, and includes not only biomedical engineering but also agricultural engineering, food engineering and biotechnology.

In part because biomedical engineering is itself a new field, there is currently no distinct academic field of biomedical engineering ethics. Ethical issues in biomedical engineering are currently studied in the fields of bioethics, medical ethics and engineering ethics. Yet, professional ethical issues in biomedical engineering are often different from the ones traditionally discussed in these fields. Biomedical engineers differ from medical practitioners, and are similar to other engineers, in that they are involved in research for and development of new technology, and do not engage in the study, diagnosis and treatment of patients. Biomedical engineers differ from other engineers, and are similar to medical practitioners, in that they aim to contribute to good patient care and healthcare. The ethical responsibilities of biomedical engineers thus combine those of engineers and medical professionals, including a responsibility to adhere to general ethical standards in research and development of technology and to do research and development that adheres to the specific standards set forth by medical ethics and bioethics.

A new, required, three credit hour senior level course has been developed and offered which seeks to address the issues perhaps uniquely confronted by biomedical engineers. The course has been taught using a student centered paradigm with the in class periods utilized for student

panel discussions, debates and free writes. Students are first introduced to applied ethical theories and a range of widely different ethical paradigms including duty and virtue based theories as well as rights-based, freedom-based utilitarianism.<sup>2</sup>

As biomedical engineering deals specifically with the nexus of engineering and life, ethical ideas borrowed from environmental ethics seem particularly relevant. One such methodology, first developed by Johnson, termed a morally deep world view, cautions that both the individual and the system(s) in which that individual is embedded, matter from an ethical point of view.<sup>3</sup> A second approach uses the development first offered by Thomas Berry<sup>4</sup> and further refined by Swimme<sup>5</sup> and Swimme and Tucker.<sup>6</sup> This paradigm takes us from an individual or local perspective on ethical reasoning to an Earth and Universe perspective which is alive, integrated and dependent. Berry described three universal principles that ought to govern our response to ethical dilemmas. Those principles include differentiation, subjectivity and communion or community. Here differentiation refers to the preference from an evolutionary perspective that life becomes more complicated and more diverse. Subjectivity is a recasting of the admonishment against treating others as objects rather than as subjects each possessing their own unique set of self interests. Communion refers to the intricate web that we belong to as citizens of the Universe. An act is ethical if it promotes differentiation, subjectivity and/or communion; it is unethical if it violates these principles.

Upon completion of this introduction to applied ethical theory with a specific emphasis on engineering ethics, the course focuses upon a set of ethical issues described by Kaebnick<sup>7</sup> that may confront them in their future careers as biomedical engineers including the following:

- Is autonomy central to bioethics and biomedical engineering?
- Are the use of biomedical developments and tools to enhance human beings ethically troubling?
- Who ultimately will have access to these developments?
- Should performance enhancing drugs be banned from sports?
- Should there be a market for artificial organs developed by engineers and scientists?

Concerning the use of animals

- Should animal tissues/organs be used in human beings?
- Should there be any limits to the use of animal tissues?
- At what point does a human being become a new hybrid species, that is, how many animal tissues/organs will it take before a human being is no longer human? As a follow-up, what does it actually mean to be human?
- Is it ethical to use animals as experimental subjects in biomedical research? Should there be any limits?

A Social Justice Model for Service Learning: Integrating the Compassion Practicum

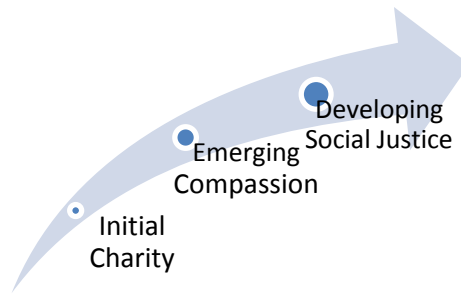


Figure 1 Service Learning Paradigm: Moving towards Social Justice

A common view is that teaching is only about the transmission of knowledge and usable skills and that education should be apolitical. In this view, teachers should not have an agenda. Though this seems to make sense in the abstract, in reality everything that happens in the classroom has political implications. The question at hand for teachers then is do we want our classrooms to support the status quo or can they be sites of change through empowering students to be active, critical citizens who will question and transform society? To be the site for change, teachers should seek to connect the curriculum to students' lives and the world around them and guide students in critical inquiry, reflection and action so that they can identify problems and offer solutions.

A classroom based on critical inquiry, reflection and action can be accomplished using a social justice model for service learning.<sup>8</sup> Such a model has three core components: the essential elements of critical consciousness, the stages of critical consciousness development as described by Cipolle<sup>9</sup> and the strategies for successfully developing critical consciousness. The focus in the present work is the third component of the social justice model. Teachers are challenged to provide a framework and activities to help guide students on the path of becoming more critically aware and create learning situations that initiate deeper self-exploration and critical analysis. One such activity is seen to be the compassion practicum.<sup>10</sup> In it, students are challenged simply to respond to the plea often attributed to Aeschylus, that is, "to tame the savageness of Man and make gentle the life of this world."<sup>11</sup>

The path to social change alluded to in the quote from Aeschylus begins with developing a critical consciousness. The four elements of critical consciousness development are:

- Developing a deeper awareness of self
- Developing a deeper awareness and broader perspective of others
- Developing a deeper awareness and broader perspective of social issues
- Seeing one's potential to make change.<sup>9</sup>

Compassion is the emotion that one feels in response to the suffering of others that motivates a desire to help. The etymology of "compassion" is Latin, meaning "co-suffering." More involved than simple empathy, compassion commonly gives rise to an active desire to alleviate another's suffering. A practicum is a school or college course, especially one in a specialized field of study

that is designed to give students supervised practical application of previously studied theory. In this course, students are required to identify suffering of others (others includes the human species as well as other species), design a response to the suffering and carry that action out. The project must involve at least 15 hours of service. Alternatively, students can explore issues associated with the use of animals in the research laboratory through service at the Farm Sanctuary in Watkins Glen. The relevance for this project's inclusion is based on the fact that a vast majority of the new devices and drugs are first tested on a wide range of animal species. One will very often hear reference to "porcine" and "bovine" animal models in the presentation of the accompanying research. This activity challenges students as future professionals to confront the ethical dilemma – the use of animals in the research laboratory --head on. Both activities focus on developing compassion --either for members of our own species or members of another. There were 50 students enrolled in the course of which 30 chose the Farm Sanctuary visit and the remaining selecting the Quality of Life project.

- An Approach to the Question of Improving the Quality of Life of Others

Implicit in designing any solution to improving others' quality of life is a recognition that life is not "fair" that there are huge inequities in our society, and some segments of society have a dominant position of privilege while others do not. A wide range of projects were accomplished by students who chose this option. A partial listing includes the following:

- Development of a life skills tutoring program for inmates in a juvenile correctional facility
- Active participation in preparing meals and providing personal support for residents of local homeless shelters
- Active participation in preparing meals and providing personal support for newly arrived immigrant families
- Development of a tutoring program for students in nearby elementary level community schools
- Development of a mentoring program for underclassmen in biomedical engineering
- "Adopting "a newly arrived immigrant family, that is, serving as an ambassador

- An Approach to the Question of Animals in Biomedical Research

Farm Sanctuary is an American animal protection organization, founded in 1986 as an advocate for farm animals. It was America's first shelter for farm animals. It promotes laws and policies that support animal welfare, animal protection, and vegetarianism/veganism through rescue, education, and advocacy. Farm Sanctuary houses over 800 cows, chickens, ducks, geese, turkeys, pigs, sheep, rabbits, and goats at a 175-acre (0.71 km<sup>2</sup>) animal sanctuary in Watkins Glen, New York. During the fall semester, the sanctuary has limited hours exclusively on the weekends. Arrangements were made with the sanctuary officials to insure that students would have ample opportunity to tour the facilities, meet and interact with the many animals and

participate in a limited volunteer project if so desired. The shelter is approximately two hours away so actual time at the sanctuary was limited to 11 hours approximately. Students visited the sanctuary in small groups, typically three or four at a time. The trip coordination and team composition was left totally up to the students.

Initial, informal feedback centered on being deeply impressed by the dedication and passionate commitment of the staff at the sanctuary. This seemingly caught most of the students off guard and they subsequently commented on it repeatedly. Second, students were quite surprised that each of the animals had their own stories as to how they( the individual animals) arrived there and, in fact, their own personalities. The matriarchal structure of the pig families as well as their coats too were commented on by many students. For every one of the students, the visit to the sanctuary was the first time they had actually interacted with a pig or a cow other than eating a ham sandwich or a hamburger.

### Reactions and Reflections of Students

Two methodologies were used to collect information concerning the class. The first was the university wide instrument SOOT (Student Opinion of Teaching) which dealt with the course in its entirety while the second focused specifically on the compassion practicum.

Considering first the entire learning experience, the following SOOT responses summarize to a large extent student reactions:

- “It encouraged critical thinking, and the class materials were always thought-provoking.”
- “The course made me think about various topics within the world and engineering. It caused me to reflect on my beliefs and challenged certain ideas I had while also exposing me to other concepts.”
- “Different type of classroom that I never had in college. such as the talking stick, ethics topics discussed openly, and watching videos from Twilight Zone. The technique of the *Last Word* per person -- we often used before class ended was incredibly powerful as a motivator to try to sum up your feelings about the topics of the day.”
- “Critical thinking aspects”
- “I loved the class discussion/eye opening discussions.”
- “Brought up different ways about looking at world problems.”
- “The course made me think about how engineering decisions can affect the world.”
- “This class really makes you think AND I LOVE IT-- it makes you question everything we do and what justifies it.”

### Analyzing the Results

Focusing upon the Compassion Practicum, two separate survey instruments were developed to attempt to quantify the effect of the quality of life project and the Farm Sanctuary project. The

survey instruments were employed after the semester was completed and all grades had been assigned.

An examination of the ANOVAs results sheds some light on the impact of the different types of projects. The following three questions are chosen for data analysis:

- Question 1. Did the visit change your understanding of the ethical dilemmas that will confront you as an engineer?
- Question 2. Has the visit changed your view of professional responsibility?
- Question 3. After further reflection on your project how would you characterize your views towards the future?

Numbers are associated with each response according to the following scheme:

- 1 - Largely Change
- 2 –Moderately Change
- 3 – Little Change
- 4 – No Change

The sums, and standard deviations are calculated for each of the three for both groups as well as the p-value between the groups are shown for each of the three questions in the table below.

Question	Project	Sum	Standard Deviation	p-value
1	Farm Sanctuary	2.25	.935	.802
	Quality of Life	2.33	.606	
2	Farm Sanctuary	2.25	1.14	.643
	Quality of Life	2.42	.638	
3	Farm Sanctuary	2.2	.273	.019
	Quality of Life	1.75	.204	

First, there is essentially no significant difference with respect to the first and second comparative questions. Students understanding of the ethical dilemmas that will confront them as an engineers are similar as are their views of professional responsibility. That which is significantly different is their views towards the future with the students who visited and help out at the Farm Sanctuary statistically, significantly more optimistic.

Further interpretation of these results are purely conjecture but I would like to suggest a couple of possibilities. First, I think students saw the challenges facing the animal world as important and real and not just the purview of a few animal activists. One student actually commented to me that he expected the project involving the Farm Sanctuary to be a total waste of time as he would be inundated with biased animal rights propaganda. He went there to actually engage in a debate with the Sanctuary workers. He later explained that the visit has in fact changed his life in many ways including what he eats and what he views as acceptable research using animal models. A second point I would like to offer is that the Farm Sanctuary is located in beautiful Upstate New York. It has countless pastoral settings, many reminiscent of the paintings often found in the paintings of the French Impressionist era. It seems that such a setting would by its very nature lift the spirits of anyone and nurture a more optimistic when contemplating the

future. A third possibility centers around the impact that the encounters students had with passionate, dedicated workers at the Sanctuary who were largely the same age as the students. Perhaps such encounters may shake students from the “comfortably numb” perspective with which they sometimes approach their daily lives. As already stated, this is simply conjecture. In fact, these questions and others will be further researched in the next offering of the course.

### A Few Final Thoughts

It is critical, I believe, that we recognize the relationship between our educational philosophy and our political views. With this in mind, the concept of an agenda warrants discussion, specifically the difference between having an agenda and pushing an agenda. An educational agenda incorporates the university’s mission, the teacher’s philosophy of education and beliefs about the students. An agenda that is seen as biased or political can be perceived as manipulative and undermine the broader purpose of education. In the classroom, students must be at the center of the educational experience, creating their own ideas, beliefs and view of the world. The role of the teacher must be to support students and create learning experiences within which students gain factual information, reflect on the newly obtained information and grapple with the reality of the world as it is.

From feedback from the students, it seems that the described course on ethics in biomedical engineering succeeded in creating the kind of learning experiences desired. Though the interested student can and probably did search the Internet for information about my views on some of the topics discussed, no student expressed any hesitation in expressing his/her own unique perspective. In fact several students who were notoriously quiet throughout their four years enrolled in the biomedical engineering program routinely shared their views openly, enthusiastically and without reluctance. This environment was created in many different ways though perhaps the most effective was the use of a Cherokee “talking stick.”<sup>12</sup> The stick is passed around from member to member allowing only the person holding the stick to speak. This enables all those present in the class to be heard, especially those who may be shy; consensus can force the stick to move along to assure that a few will not dominate the discussion.

The course will again be offered next year and will incorporate the different service projects as it has this past year. It has been an incredibly enriching experience for me. I look forward with great anticipation to its second offering.

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