2006-1013: A VIRTUE ETHICS APPROACH TO ENGINEERING ETHICS

William Jordan, Baylor University

WILLIAM JORDAN is Professor and Department Chair of Mechanical Engineering at Baylor University. He has B.S. and M.S. degrees in Metallurgical Engineering from the Colorado School of Mines. He has an M.A. degree in Theology from Denver Seminary. His Ph.D. was in mechanics and materials engineering from Texas A & M University. He teaches materials oriented courses and his main research area deals with the mechanical behavior of composite materials. He also writes and does research in the areas of engineering ethics and engineering education. He is a registered metallurgical engineer in the state of Louisiana.

A Virtue Ethics Approach to Engineering Ethics

Abstract

Engineering educators have a responsibility to promote the ethical practice of engineering by our graduates. For current students this includes how honest is their academic work. This paper deals with how to motivate the students to be ethical in their academic work as well as in their future careers.

Professors need to develop a way to motivate students to behave in an ethical manner. Simply reciting what the codes of conduct say does not appear to be sufficient. A significant approach to do this has been done by Seebauer and Barry[1]. They have integrated a virtue ethics approach into teaching about engineering ethics. Using their book as an inspiration, this paper attempts to develop a virtue based engineering ethic that will be seen by students as useful. To do this a virtue ethics approach will be applied to codes of conduct as well as a few case studies. Someone who has adopted a virtue ethics approach will have an internal motivation to make good choices in most situations.

Introduction

The author has previously reported on using case studies as a way to teach engineering ethics[2,3,4]. Engineering codes of conduct were used as a basis to evaluate the cases. While cases studies have real merit, by themselves they do not give sufficient guidance as to which decisions to make in a given situation. Codes of conduct can be useful in giving such guidance. While codes may have a legal authority, some students have questioned the moral authority of the codes. Therefore the next step was to analyze engineering codes of conduct using different moral theories[5].

There is a concern that many engineering students see all of this analysis as too theoretical. They frequently make decisions without regard to official codes of conduct. This was noticed in our previous work where student perspectives on academic misconduct were analyzed[6,7] . A large majority of our students claimed they have never cheated. A similar large majority admitted that they do things that are a violation of the professor's academic misconduct standard. It appears that many students have adopted a post-modern perspective on ethical behavior. They claim they are not cheating because they are obeying their definition of what cheating is; the professor's stated policy on cheating is not important. This conclusion has significant bearing on the sufficiency of ethical codes of conduct. Students need to have an internal motivation to make good choices. We therefore decided to relate moral theories directly to the decision making process[8]. While this may provide help for students unwilling to use the codes as standards, it does not ultimately deal with the issue of providing an internal motive to do what is right.

Introduction to Virtue Ethics

Virtue ethics is not a new concept. Most people regard it as something that was initially developed (as far as the Western world is concerned) by Aristotle more than 2300 years ago. Many ethical approaches concentrate on how to make good decisions when faced with difficult situations. Aristotle's approach was to emphasize virtuous living. A good person will make good decisions, so what is important is to become a good person. In the 1200's Thomas Aquinas integrated this philosophy with a Christian perspective on the world. Aquinas' perspective was to dominate Western philosophical thinking for hundreds of years. For much of the 20th century virtue ethics was not commonly taught as a viable option by most philosophers. Various utilitarian approaches became much more commonly used. An interesting history of the development of ethical thinking in the Western world has been written by MacIntyre[9].

In 1984 Alasdair MacIntyre published his book *After Virtue: A Study in Moral Theory*[10]**.** This book, which has helped to re-establish virtue ethics as a viable philosophical perspective, has been very controversial with its rejection of much modern thinking, such as utilitarian approaches to ethics. This author, however, became exposed to virtue from a different source. Martin and Schinzinger's engineering ethics book[11] mentions virtue ethics as one of the options for approaching ethics. In 1993 virtue ethics was made very prominent in the popular literature with the publishing of William Bennett's best selling book, *The Book of Virtues*[12]. This book is not formally an ethics book at all, but is aimed at moral education of the young. Bennett's book makes the point that one way to promote good character in children is to expose them to good character concepts through stories. This approach to moral education is very consistent with that of Aristotle and Thomas Aquinas.

There are many different lists of virtues. The purpose of this paper is not to argue about what the virtues are but more how to use them in ethical decision making. The author will therefore accept for the sake of discussion the following lists, which come from Seebauer and Barry's book[1]. The author is not claiming these are the only virtues.

<u>Classic virtues</u>

- Prudence
- Temperance
- Fortitude
- Justice
- Faith
- Hope
- Love

The first four above are commonly called the cardinal virtues. These terms date back to the work of Aristotle. The others have been added over the years. This list of seven classical virtues date back to the time of Thomas Aquinas. Only the first four of this virtues (those dating from Aristotle) will be used in the analysis section of this paper.

Similarly, there are often considered to be seven classic vices. Just as we should act to reinforce the virtues in our lives, we should act to resist the development of these vices.

Classic Vices

- Pride
- Lust
- Gluttony
- Envy
- Anger
- Greed
- Sloth

One of the issues that is sometimes raised is whether the virtue ethics perspective is too religious in nature for a secular profession such as engineering. The virtues described above are consistent with those taught by many different religious traditions. Harrington and Keenan[13] have made an explicitly religious case for virtue ethics. However, when contrasting rights and virtue ethics perspectives Whitbeck makes the following observation[14] on page 20 of her book.

> "The notions of a moral rule, and that of virtue…have been explicitly used in a larger range of cultures than has the notion of a right. Virtually every ethical and major religious tradition employs some counterpart of the notions of virtue and moral rule."

Clearly many different cultures have embraced the concept of virtues as being part of a way to analyze the decision making process. The basic virtue ethics approach goes back to Aristotle, who is not regarded as a religious leader. Seebauer and Barry[1] have presented a purely secular version of virtue ethics in their book published by Oxford University Press, which is clearly a secular publisher. The author has followed their secular approach in this paper. A virtue ethics approach to engineering ethics is a concept that can supported alike by both secular and religious engineers.

Virtue Ethics and Engineering

The author has previously used virtue ethics as one of several ways that engineering codes of conduct can be evaluated[5]. He has also used moral theories as an aid to directly making choices in difficult situations[8]. In his 2004[7] paper on student cheating, he recommends that teaching a virtue ethics approach to engineering ethics might be helpful in discouraging cheating.

A virtue ethics approach has been discussed in a number of engineering ethics books. Martin and Schinzinger's book[11] has a chapter on moral frameworks for making ethics decisions. Virtue ethics is discussed as one of four common frameworks. Carolyn Whitbeck also discussed virtue ethics in her engineering ethics book.[14] Much of the inspiration for this work has come from the engineering ethics text book written by Seebauer and Barry[1].

In the fall of 2005 the author and a colleague of his conducted surveys about engineering ethics issues at two different universities (Mississippi State University and Baylor University). Their results will be published in another paper at the 2006 A.S.E.E. annual meeting[15]. Two tables from that paper are relevant here. The first one describes the amount of cheating that is occurring at these universities.

Table 1					
Have you ever cheated in college?					
	Never (%)	Once (%)	Few Times (%)	Frequently (%)	Often as needed (%)
Weighted Average 2005	49	11	37	3	0

A majority of the students admit to having cheated in college. For further details, please see our other paper[15], for the actual amount of cheating may be much higher than reported. It is clear that cheating remains a significant problem.

As part of the survey, we presented the students with brief descriptions of four different moral theories. We then correlated their answers to the question about cheating with their answers to which moral theory they subscribe to. We have found the characterization of moral theories in Martin and Schinzinger's book[11] to be useful. The following terms are adapted from their book. They list four broad categories of moral theories:

- Duty Theories
- Rights Theories (sometimes called respect for persons theories)
- Utilitarian Theories
- Virtue Theories

Each of these theories defines what sorts of action it approves. In our survey, we gave short definitions of each perspective and asked the students which one they believed. These definitions are shown below:

Duty ethics—there are certain duties to others that most people would recognize. Our obligation is to obey these duties. Examples of these are to help those in difficulty, to protect those who are weak, to protect our environment

Respect for persons ethics—we need to make sure that the rights of others are respected in all of our actions.

Utilitarian ethics—we should make decisions that will benefit the most people. Doing the greatest good for the greatest number of people is a common way to express it.

Virtue ethics—we should not worry about how to make ethical decisions. We should instead strive to become a virtuous person. People of good character will ultimately be people who make good decisions

The results are shown in Table 2 below.

Table 2 Correlation of Basic Ethical Systems and Cheating 2005 Results				
	Students believing in			
	Duty ethics (%)	Respect for Persons Ethics (%)	Utilitarian Ethics (%)	Virtue Ethics (%)
Have you ever cheated in college?				
Never	43	55	33	66
Once	13	9	26	4
A few times	39	36	33	30
Frequently	4	0	8	0
As often as needed	0	0	0	0

With respect to virtue ethics, 66% of those who say they believe in this approach claim they have never cheated, while 4% have cheated once, and 30% have cheated a few times.. Those who believe in virtue ethics appear most likely to not cheat (66% said they have never cheated), while those who believe in utilitarian ethics are the most likely to cheat (67% have cheated one or more times).

These results are not surprising. Virtue ethics states that a person should make choices that reinforce good character. Cheating is certainly not reinforcing good character traits. On the other hand a person believing in utilitarian ethics might well conclude that the chance of getting caught cheating is so low, that the benefits of a better grade are worth the small cost. This means that an effective presentation about virtue ethics might have some impact upon the students' ethical behavior.

Applying Virtue Ethics to Codes of Conduct

The following examples of applying virtue ethics to codes of conduct are expansions and adaptations from the author's 2002 paper[5]. There are many aspects of the codes we could examine. To illustrate our perspective we will look at four different parts of the NSPE code[16].

Section II.1.a
Engineers shall hold paramount the safety, health, and welfare of the public. If engineers' judgement is overruled under circumstances that endanger life or property, they shall notify their employer or client and such other authority as may be appropriate.

This section is at the heart of the concept of a code of conduct. Engineers should primarily be concerned with the safety and welfare of the public. A virtue ethics perspective would endorse this position, as engineers of good moral character should always be concerned with the welfare of the public whom they are serving.

Section II.2.c
Engineers shall endeavor to extend public knowledge and appreciation of engineering and its achievements.

This policy appears to be one that is concerned with promoting the image of the profession as much as promoting safety of the public. One virtue ethics person might approve this as being the natural outgrowth of what a good engineer should do—share his work with others. Another virtue ethics person might see this policy as a self serving one, promoting arrogance in our profession rather than anything useful.

Section II.5.a
Engineers shall avoid deceptive acts. Engineers shall not falsify their qualifications or permit misrepresentation of their or their associates' qualifications.

This policy would probably be endorsed by a virtue ethics perspective. Being deceptive in getting work, is certainly not a positive character trait that virtue ethics would endorse. An engineer who got work by deceptive means has a great possibility of being incompetent in the area. For otherwise, why would someone use deceptive techniques if their abilities were good enough to legitimately get their work? The incompetent practice of engineering is something that could hurt large numbers of people.

Let us examine the note at end of the NSPE code relating to competitive bidding.
By order of the United States District Court for the District of Columbia, former Section 11(c) of the NSPE Code of Ethics prohibiting competitive bidding, and all policy statements, opinions, rulings or other guidelines interpreting its scope, have been rescinded as unlawfully interfering with the legal right of engineers, protected under the antitrust laws, to provide price information to prospective clients...

Statement of NSPE Executive committee
In order to correct misunderstandings which have been indicated in some instances since the issuance of the Supreme Court decision and the entry of the Final Judgement, it is noted that in its decision of April 25, 1978, the Supreme Court of the United States declared: The Sherman Act does not require competitive bidding

1. *Engineers and firms may individually refuse to bid for engineering services...*
4. *State societies and local chapters are free to actively and aggressively seek legislation for professional selection and negotiation procedures by public agencies.*

NSPE originally had in its code of ethics an explicit ban on using competitive bidding to obtain engineering services. The federal court system has ruled that this is a violation of the antitrust laws of the United States and cannot be enforced. This shows that there is nothing unique to

these codes that makes them self authoritative. They must be adapted and changed to correspond to the laws of our society. The further note by NSPE notes that no engineering firm is required to engage in competitive bidding, so if an agency seeks bids on this basis, any (and every) firm is allowed to not respond to such a request for bids. Engineers are even allowed to lobby state legislatures to come up with alternative methods to competitive bidding. This means that while NSPE cannot call an engineer unethical for engaging in competitive bidding, it can still discourage her from doing so.

This former code item is an example of things that were put into the codes of conduct to protect those who are already in the profession more than those who are just entering it. For the people most likely to win by competitive bidding are young engineers (and young firms) that are willing to work for less money to get more work. The firms most likely to lose by this method are older, more established ones who have higher overheads and must charge more for their services.

A virtue approach would criticize this former policy. This policy is based on protecting those already in the profession and hurts those who are just starting out. It is not promoting justice in the awarding of bids. It is promoting the vice of greed within the established engineering firms.

Applying Virtue Ethics to Case Studies

One of the criticisms of virtue ethics is that it too general, that engineers in many situations will need more detailed advice about how to make good decisions. Insights from the book by Seebauer and Barry[1] can provide some significant help in this regard. The following discussion is adapted by this author from their book.

The net goodness of any action can be determined by analyzing for each consequence the product of the goodness of that consequence multiplied by the importance of that consequence which is then multiplied by its likelihood. In a similar manner the badness of each decision can be determined. This approach sounds very much like a utilitarian one. However, there are two important distinctions. Seebauer and Barry write on page 91 of their book that this approach

> "deviates from utilitarianism in one crucial way by evaluating benefits and harms explicitly according to the *moral* standards of the virtues. The goodness of each consequence is determined entirely by how it squares with the virtues."

Seebauer and Barry also state that part of this analysis is also the person's intentions, not just their actions. Do their intentions promote a virtuous life, or act to hurt it?

To make this method seem more real, we will examine a couple of case studies from the author's 2002 publication[4]. In that publication a moral theory analysis was not used. This time we will use a virtue ethics approach as suggested by Seebauer and Barry to make the analysis.

Case #1

You are a mechanical engineer working for a steel company. You supervise the pickle line and as a part of your work have developed a technique where you can weld together stainless steel in such a fashion that the welded joint can be cold reduced on the rolling mill. This was done as

part of your work, but it was done on the evening shift and none of your supervisors are aware of it. Should you:

(a) Patent your technique and make a profit out of it.
(b Patent your technique and assign patent rights to your company.
(c) Tell your supervisor and let him decide what else to do with the idea.

An engineer using a utilitarian approach would examine whether or not the company had a formal intellectual property policy that had been agreed to by all parties. If there was no written policy, he might very well try to do option (a) and make a profit at the expense of the company.

We will examine all three options using a virtue ethics approach.

- Option (a)
  Your motive for this could be the desire for justice, based on the concept that this is your own idea and that it should belong to you. However, justice might require that this really belongs to the company for it was done on company time. This approach might also be promoting the vice of greed in the engineer as he seeks to maximize his profits at the possible expense of the company. Prudence would suggest that you should not do this, for the company may respond very negatively to your proposed actions. This is because the probability of a very negative reaction by the company is very high and its severity is also very high (they may well fire the engineer). When trying to balance out the different potential consequences, prudence would strongly suggest that you do not take this approach.

- Option (b)
  This approach would support the virtue of justice, for the company has a good claim on your work if it was done on company time and with company equipment. Since the patent would be in the engineer's name, it would also reinforce justice for the engineer. It would also be a prudent thing to do. The company is likely to respond very positively to this response.

- Option (c)
  This was certainly be prudent thing to do, for the company would not be unhappy with what you have done. However, it might not be justice for the engineer who has done the work. It might also promote the vice of greed among company officials. When balancing out the potential benefits to the engineer (promoting prudence) against the potential harms (lack of justice for the engineer and promoting greed in the company) it appears that this is may not be a good choice.

Case 2

You are the assistant chief engineer at a steel mill. Your boss is only a few years older than you and you do not see much chance for advancement. A competitor has offered you a job at a higher salary. You are considering accepting the offer. However, this incident has caused you to consider whether you might be worth more than you had imagined. You therefore go to your present company to see if they would match the offer. They did match the offer and you agreed to stay. Should you then:

(a) Keep at your present company with their higher matched salary.
(b) Go back to the competitor to see if they would increase their original offer even more.

An engineer using a utilitarian approach might decide that the increased personal profits are worth breaking the promise to his original company.

We will examine both options using a virtue ethics approach.

- Option (a)
  This may be a difficult step as it goes against most people's desire to maximize income. However, the reinforcing of the virtues of prudence and justice should outweigh the desire for more money based on greed. The just thing to do is to keep your word.

- Option (b)
  This option involves the engineer deliberately going back on his promise to stay with his present company. This would certainly not be promoting the virtues of justice or prudence. It would be promoting the vice of greed because it is based on a desire to increase income irrespective of the means of doing so. There is also a very high probability that the company's sense of justice will cause it to react very harshly. This choice does not promote justice or prudence to the individual, but reinforces the vice of greed. It is not a good choice.

Conclusions and Recommendations

This paper has analyzed a virtue ethics approach to engineering ethics. There was a brief introduction to moral theories and how virtue ethics has been developed over the years. A virtue ethics analysis was applied to several parts of the N.S.P.E. code of ethics. A virtue ethics analysis was applied to several different real world case studies.

It appears that a virtue ethics approach to engineering ethics provides useful insights not available by other methods. It is an approach that can be taught in the classroom and practiced by engineers. This paper is the author's first extended attempt to apply virtue ethics to engineering practice. The case studies examined in this paper were not terribly complex. However, virtue ethics has great potential to be able to deal with complex situations. The author intends to continue work in this area, refining how virtue ethics is used to solve engineering ethics problems.

References

[1] Seebauer, E.G., and Barry, R. L., *Fundamentals off Ethics for Scientists and Engineers*, Oxford University Press, Oxford, 2001.

[2] Jordan, William, and Latcha, Michael, *Specifications for a Conflict: An Engineering Ethics Case Study*, *Proceedings of Frontiers In Education 26th Annual Conference*, Salt Lake City, November 6B9, 1996, pp. 1164B1167.

[3] Latcha, Michael, and Jordan, William, *To Ship or not to Ship: An Engineering Ethics Case Study*, *Proceedings of Frontiers In Education 26th Annual Conference*, Salt Lake City, November 6B9, 1996, pp. 1159B1163.

[4] Jordan, W., *Ethics for the Real World: Case Studies in Industrial Ethics*, presented at the Gulf Southwest Regional Meeting of A.S.E.E., March 2002. In CD based *Proceedings* (no page numbers).

[5] Jordan, W, Elmore, B, and Napper, S., *Using Moral Theories to Evaluate Engineering Codes of Conduct*, presented at the A.S.E.E. Annual Meeting in Montreal, Quebec, Canada, June 2002. In CD based *Proceedings* (no page numbers).

[6] Jordan, W.M., "Academic Misconduct: A Student Perspective", *International Journal of Applied Engineering Education*, Vol. 7, No. 1, (1991), pp. 2B7.

[7] Jordan, W., and Elmore, B., *An Engineering Student Perspective on Ethics*, in *Proceedings of Christian Engineering Education Conference*, Salt Lake City, June 2004 in *Proceedings*, pp.85-98.

[8] Jordan, W., Elmore, B., and Napper, S., *Using Moral Theories to Help Engineers Make Ethical Decisions*, presented at the Gulf Southwest Regional Meeting of A.S.E.E., Arlington, TX, March 2003. In CD based *Proceedings* (no page numbers).

[9] Mac Intyre, A., *A Short History of Ethics*, Macmillian Company, New York, 1966, 280 pages.

[10] Mac Intrye, A., *After Virtue: A Study in Moral Theory*, University of Notre Dame Press, Notre Dame, Indiana, 1984, 286 pages.

[11] Martin, Mike, and Schinzinger, Roland, *Ethics in Engineering, Fourth Edition*, McGraw-Hill, Boston, 2005.

[12] Bennett, William, *The Book of Virtues: A Treasury of Great Moral Stories*, Simon and Schuster, New York, 1993.

[13] Harrington, D., and Keenan, J., *Jesus and Virtue Ethics*, Sheed and Ward, Lanham, Maryland, 2002.

[14] Whitbeck, Carolyn, *Ethics in Engineering Practice and Research*, Cambridge University Press, Cambridge, 1998.

[15] Jordan, W., and Elmore, B., *Engineering Ethics and Moral Theories : A Student Perspective*, to be presented at the 2006 A.S.E.E. annual meeting in Chicago, 2006.

[16] N.S.P.E. code downloaded on 1/15/06 from the N.S.P.E. website www.nspe.org/ethics/eh1-code.asp