2006-1015: ENGINEERING ETHICS AND MORAL THEORIES: A STUDENT PERSPECTIVE

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Engineering Ethics and Moral Theories : A Student Perspective

Abstract

As engineering educators we must responsibly promote competent and ethical engineering practice by our engineering graduates. For our current students ethical practice in pursuit of engineering education is foundational to ethics in the workplace.

We have previously analyzed student perspectives on academic misconduct[1,2]. Surveys were taken at a public university in the southern United States at two instances separated by a 14 year interval. We contrasted the changes in student attitudes that occurred during the time period between the two papers (1990-2004). In this paper we have expanded our analysis to three different universities in the southern United States. Two of them are public and one of them is private. We have also expanded the survey to include questions about different moral theories. As a basis of comparison, we included the following moral theories: utilitarian ethics, respect for persons ethics, duty ethics, and virtue ethics. Since these are new terms for most engineering students, we used adapted summaries of these four theories from the engineering ethics book by Martin and Schinzinger[3]. We have made correlations between the moral theories that the students chose and their decisions on several different academic misconduct issues.

Solving problems through the use of tools such as decision matrices is familiar to engineering students. We have therefore found that the approach taken by Dr. Norman Geisler is appealing to engineering students[4]. He asks a series of questions, and then assigns people to different categories based on their answers. These questions include such ones as:

- Are there absolute standards as to how people should behave?
- Are there general standards as to how people should behave?
- If there are absolute standards, do they ever conflict? If so, how do you decide which standard to obey?

We have also correlated how students responded to Dr. Geisler's questions and how they responded to questions of academic misconduct.

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 as important. This conclusion has significant bearing on the sufficiency of ethical codes of conduct.

Introduction

Cheating in the engineering class room is not a new phenomenon. The difficulty is in how to combat it. As engineering educators we have the responsibility to promote the competent and ethical practice of engineering by our students as they enter the workplace. To effectively do this, we need to understand their perspective on ethical issues. In this paper we report on our students' attitudes concerning several cheating related issues. We surveyed engineering students at Louisiana Tech University in 1986-1990[1] and again in 2004[2]. We have followed this up with

an expanded survey of engineering students at Mississippi State University and Baylor University in the fall of 2005. We will compare and contrast the 2005 results with our previous results.

Mead reported in 1992 that 74% of engineering students have admitted to cheating[5]. Harding has reported that students who agree cheating is wrong are still reluctant to report it[6]. In their study 80% of students had observed cheating by others but had not reported it. This is consistent with our 1991 paper[1], where we found that 92% of the students knew of someone else who had cheated. However, 43% of them said they would never report it, and another 53% said they might report. Only 4% said they definitely would report it.

Current survey

This paper is partly based on the authors' experiences in engineering education at three universities. The 1991 and 2004 surveys were at Louisiana Tech University, which is a medium sized public university in the rural south. While it is a state supported school it is in a very conservative part of a very conservative state. Most of our students come from north Louisiana which is heavily influenced by a conservative church culture. The authors then each moved to other universities in 2005. We took surveys in these universities in the fall of 2005. Mississippi State is a state supported university that has some similarities to Louisiana Tech. While approximately 30% larger in student population as Mississippi's land grant university, it has a similar diversity in students compared to those at Louisiana Tech. Baylor University is a Christian university in the Baptist tradition. It has about 13,000 students from all 50 states, with a majority of them coming from Texas.

Students in several different classes were surveyed. In most cases we will compare and contrast the 2005 results with our previous work. In order to make it easier to compare our results, most of the questions in the 2005 survey were identical to those in the 1991 and 2004 surveys. This year we added questions that deal with students basic ethical perspectives. In particular, which moral theory they might use in making personal ethical decisions.

The 1991 survey was mostly juniors and seniors. The 2004 survey consisted of students in freshman, junior and senior classes. The 2005 survey consisted of sophomore chemical engineering students at Mississippi State and junior and senior students at Baylor. These junior and senior students were a mixture of Mechanical Engineering and Electrical and Computer Engineering. In most cases, we did not see any differences in ethical perspectives between majors or between years (freshman, junior, etc.). In a few cases students in different years responded differently, and those results will be reported.

The surveys were taken anonymously. The surveys were done in groups, so we know which class the students were in.

Results and Interpretations

Our general observation is that the amount of cheating is probably underreported. We do not know of a motive for a student to admit cheating, when he has not done so. However, some students may have had a motive to deny cheating for fear that they might be caught.
The results to the basic question of whether or not they have cheated are shown below in Table 1. The values for frequency of cheating are reported as percentages of the total number of respondents.

Table 1

Have you ever cheated in college?

	Number of Students	Never (%)	Once (%)	Few Times (%)	Frequently (%)	Often as needed (%)
1991 Paper	259	30	14	51	2	3
2004 Paper	141	57	17	25	0	1
2005 Results						
Soph	31	61	6	29	3	0
Juniors	26	50	12	35	4	0
Seniors	14	21	21	57	0	0
Weighted Average 2005	71	49	11	37	3	0

The 2005 students claim they have cheated less than their counterparts 14 years ago. This is not consistent with our anecdotal observations. As will be discussed later in the paper there may be other reasons for these results.

When the 2005 results are broken out by class an interesting difference is noted. As students progress from freshman to junior to senior years, they report they are more likely to cheat in their classes. While the data for 2005 is rather limited, we noticed the same trends in our 2004 paper which surveyed more students. This trend has also been noticed by Moffatt[7]. There are several possible conclusions to this. Students may be getting less ethical as they progress in the curriculum. They may be facing more trying and demanding courses that create more temptations to cheat. Or they may be just getting more honest about what all of them have been actually doing.

The next step was to analyze whether the students overall grade point average correlated with their likelihood of cheating. Results for this are shown in Table 2 below.

Table 2 Have you ever cheated in college?						
	Number of Students	Never	Once	Few Times	Frequently	Often as needed
1991 average GPA		3.12	2.91	2.94	2.75	2.75
2004 average GPA	141	3.23	3.17	3.17	--	3.20
2005 average GPA	71	3.45	3.32	3.03	--	--

The 1991 paper showed a slight correlation of grades with cheating. Students with higher grades were slightly less likely to cheat. It should be noted that the students surveyed in that paper were all juniors or seniors taking a required course in engineering ethics. Results for the 2004 survey and 2005 survey also show this slight trend.

Table 3 below presents information concerning whether a student has observed cheating by others.

Table 3 Do you know someone who has cheated at our university?				
	No (%)	One (%)	Several (%)	Many (%)
1991 results	8	7	55	30
2005 results	30	7	56	7

This also shows an apparent trend toward more honesty, or at least toward less blatant cheating. We believe the explanation for this is in changing student definitions of cheating. There is an inconsistency here in that 70% of the students claim they have seen others cheat, but only 51% admit to having cheated themselves.

Table 4 below shows student attitudes toward others who are cheating.

Table 4				
Do you feel obligated to report someone whom you know has cheated?				
	Never (%)	**Sometimes (%)**	**Always (%)**	**Only if it lowers the curve (%)**
1991 results	43	53	3	1
2005 results	42	48	1	8

This is among the more disappointing results in our entire survey. While 60% of our students claim they have never cheated or cheated only once, a large majority will not report others who cheat. Only 1% said they would always report someone else who cheated and 42% said they would never report another cheater. Unfortunately these results are not unique to our three universities. Harding[6] reported in his surveys that 80% of students have witnessed cheating but not reported it. Students appear to have the attitude that their only concern is their personal honesty. Honesty by others in the classroom is not their concern. If carried over into the workplace such attitudes would allow fellow engineers to act unethically or incompetently without their peers doing anything about it.

While each of our universities has some definition of cheating, there is freedom for faculty members to have more detailed definitions in their different courses. Students appear to agree that different courses should have different cheating standards. This is shown in Table 5 below.

Table 5				
Should all professors have the same standards as to the definition of cheating?				
	Number of Students	**Yes (%)**	**Don't Know (%)**	**No (%)**
1991 paper	259	35	17	48
Weighted average 2005	71	32	18	50

These results have not changed significantly over the last 15 years.

We then asked questions concerning several different activities that might or might not be cheating. One of them is shown below in Table 6.

Table 6					
Is it fair for students to work together on homework?					
	Number of Students	**Yes (%)**	**Depends on class (%)**	**Depends on assignment (%)**	**No (%)**
1991 paper	259	62	23	12	3
Weighted average 2004	147	71	13	15	1
Weighted Average 2005	71	71	10	19	0

It is interesting that over 70% of our students said yes to working together on homework, irrespective of the individual professor's policy on it. Harding has reported an even higher number of 92% who agree that group work is always acceptable[6]. The students have created their own definition of cheating, and working together on homework is defined to not be cheating, even if an individual professor has stated otherwise.

This student created definition of cheating is shown with more emphasis when we asked them if they sometimes do something a professor might think is cheating, but they honestly feel is acceptable cooperation. Results for this are shown in the Table 7 below.

Table 7					
Do you sometimes do something a professor might think is cheating but you honestly feel is acceptable cooperation?					
	Number of Students	**Never (%)**	**Sometimes (%)**	**Frequently (%)**	**Almost Always (%)**
1991 results	259	21	66	11	2
2004 results	142	45	48	7	0
Weighted Average 2005	71	33	66	1	0

A large majority of the students admit that they sometimes or frequently do things they think are acceptable, but that might have been defined to be unacceptable by their professor. This is a very post-modern position. The students have created their own definition of cheating. Based on their definition of cheating, they are behaving honestly. The fact that this definition of cheating is not the official one of the professor in charge of the class does not seem to mean much to our students.

A similar result has been found by Carpenter, et al[8]. They concluded: "the rate at which engineering students cheat will vary depending on whose definition of cheating is used: their own, the institutions, or the instructor." Students who use their own definition of cheating will claim they are more honest than those who accept the professors' definition of cheating.

While surveys were done anonymously, it was possible to correlate each student's answer on different questions. A significant proportion of those who claimed to have never cheated, admit that they have done things they knew their professors regarded as cheating. This is shown in the following table, which shows the results from the 2005 survey. While the specific results were different in the 1991 and 2004 survey, the same general trends were observed.

Table 8

Correlating answers to questions about cheating and do you ever do something that a professor might think is cheating but you think is acceptable cooperation
2005 Results

	Have you ever cheated in college?				
	Never (%)	Once (%)	Few times (%)	Frequently (%)	Often as needed (%)
	49	11	37	3	0
Do you sometimes do something a professor might think is cheating but you honestly feel is acceptable cooperation?					
Weighted 2005 averages					
Never (%)	50	25	15	0	--
Sometimes (%)	47	75	85	100	--
Frequently (%)	3	0	0	0	--
Almost always (%)	0	0	0	0	--

The first row of numbers show the answers to the question: *Have you ever cheated in college?* Then within each column are how each subgroup answered the question: *Do you sometimes do something a professor might think is cheating, but you honestly feel is acceptable cooperation?* For example, 49% of the students said they never cheated. Of that group that claimed they never cheated, 47% admit to sometimes breaking a professor's standard, while 3% admitted they frequently did something a professor would not approve. Fifty percent of the students who claimed to have never cheated admit that they sometimes or frequently do things that their professors would not approve. This indicates that the number who has never actually cheated is much lower than claimed. For those who claimed to have cheated only once, 75% of them admit to sometimes or frequently doing things they know their professor has defined to be cheating.

This last table shows that many students have created their own definition of cheating. Carpenter, et al have reported the same phenomenon[8]. They believe they are ethical for they have redefined cheating to mean what they want it to mean. This is a very post-modern approach.

One of the issues we could not isolate in this survey relates to the relativism of the students' apparent definition of cheating. Is the issue the definition of cheating or who has the right to define cheating? Some students may not be rebelling against the definition of cheating as much as they are rebelling against the professor's right to define it. This is also an ethical issue, but not one we have been able to analyze in any detail.

Several questions we added in the 2005 survey deal with the students approach to ethics. We wanted to see if students who believed in different moral theories would behave in different ways. Many engineering students are very uncomfortable thinking about such philosophical things as moral theories. However, we believe that exposure to these concepts will help students to better understand how and why they make the decisions that they make. We have found the characterization of moral theories in Martin and Schinzinger's book[3] to be useful. The following terms are adapted from their book. They list four broad categories of moral theories:

- Utilitarian Theories
- Duty Theories
- Rights Theories (sometimes called respect for persons 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.

Results of this survey are shown in the table below.

Table 9 Basic Ethical Systems 2005 Results				
Year	**Percent students believing in**			
	Duty ethics	**Respect for Persons Ethics**	**Utilitarian Ethics**	**Virtue Ethics**
Sophomores	29	13	19	39
Juniors	35	19	15	31
Seniors	38	23	15	23
Weighted Average	33	17	17	33

The two largest groups were those who believe in duty ethics and virtue ethics. Fewer of our people say they believe in respect for persons ethics or utilitarian ethics.

An alternative approach to moral theories is that outlined by Geisler[4]. We have found that this methodology appeals to many students because it asks a series of questions, and how you answer those questions determines what system you believe in. The diagram below shows the question that was asked the students. For the first few questions, the answer of each question led them to another question below it. They eventually worked their way to a final description of their ethical perspective. The answers in bold print are the different ethical perspectives.

<table>
<tr><td colspan="5">Do you believe that there are absolute standards of behavior in our world?</td></tr>
<tr><td colspan="3">Yes</td><td colspan="2">No</td></tr>
<tr><td colspan="3">Do you believe there are more than one absolute standard that we should obey?</td><td colspan="2">Do you believe there are general standards?</td></tr>
<tr><td colspan="2">Yes</td><td>No. The one standard is usually expressed as always doing the loving thing.</td><td>Yes</td><td>No</td></tr>
<tr><td colspan="2">Do these standards ever conflict?</td><td>Situationism</td><td>Generalism</td><td>Antinomianism</td></tr>
<tr><td>Yes</td><td>No</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">You should therefore:</td><td>Unqualified absolutism</td><td></td><td></td></tr>
<tr><td>Obey the higher standard</td><td>Do the lesser of two evils</td><td></td><td></td><td></td></tr>
<tr><td>Graded absolutism</td><td>Conflicting absolutism</td><td></td><td></td><td></td></tr>
</table>

Results for this portion of the survey are shown in Table 10 below.

Table 10 Alternative Ethical Systems						
Year	**Percent students believing in**					
	Graded absolutism	Conflicting absolutism	Unqualified absolutism	Situationism	Generalism	Antinomianism
1991 Weighted Average	38	22	10	14	15	1
2005 Results						
Soph	21	27	4	4	44	0
Juniors	31	12	0	23	35	0
Seniors	43	21	0	7	29	0
Weighted Average	29	20	2	11	38	0
Explanation of terms						
Graded absolutism	There are more than one absolute standards that may conflict. If they do, obey the higher standard.					
Conflicting absolutism	There are more than one absolute standards that may conflict. If they do, do the lesser of the two evils.					
Unqualified absolutism	There are more than one absolute standards, but they never really conflict.					
Situationism	There is one absolute standard which should be obeyed. This is commonly referred to as love. In every situation you should do the loving thing.					
Generalism	There are general standards of behavior.					
Antinomianism	There are no standards of behavior.					

Over the years there appears to be a growth in the generalism perspective (going from 15% in 1991 to 38% in 2005). If you sum up the first three categories you get the percentage of students who believe in some sort absolute standards. In 1991 70% of the students said they believed in absolute standards of behavior, in 2005 this was 51%. The percentage of those who believe in absolute standards has decreased.

We are not sure how well the students understood the terminology used in Table 10. For example 38% of the students said they believed in a generalism approach. However, generalism is very similar to utilitarianism which only 17% of the students said they believed. Since the surveys were given the students in different locations, we did not explain the terms to them, other than what was in the survey. If they had received a lecture on moral theories where these terms were discussed, the results in Tables 9 and 10 might be more consistent. Anecdotal responses from the Baylor students indicated they understood the terms in Table 9 more than they did in Table 10. The Table 9 results are probably more reliable.

We then attempted to correlate the results about cheating with the moral theories used by the students. The first set of data is shown in Table 11 below.

Table 11 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.

These results indicate that we might be able to encourage more honesty in our students by teaching the values of a virtue ethics approach. The authors have taken this perspective in our 2004 paper on cheating[2]. There is a fascinating book by Seebauer and Berry that develops an entire engineering ethics approach using virtue ethics[9]. The first author is presenting another paper at the A.S.E.E. 2006 conference that recommends using a virtue ethics approach in teaching engineering ethics[10].

Table 12 below shows the correlations for the approach suggested by Geisler.

Table 12 Correlation between Alternative Ethical Systems and cheating 2005 Results						
	Students believing in					
	Graded absolutism	Conflicting absolutism	Unqualified absolutism	Situationism	Generalism	Antinomianism
Have you ever cheated in college?						
Never (%)	48	47	100	56	50	--
Once (%)	13	11	0	11	9	--
A few times (%)	39	37	0	33	38	--
Frequently (%)	0	5	0	0	3	--
As often as needed (%)	0	0	0	0	0	--
Percent of students with this ethical position	29	20	2	11	38	0

These results indicated that there is not a good correlation between Geisler's list of moral theories and ethical behavior. This is inconsistent with the results of the previous table. As mentioned earlier, we are not sure how well the students understood the terminology used in Geisler's approach. We believe that the results from the more traditional theories mentioned in Tables 9 and 11 are probably more reliable.

Conclusions and Recommendations

There are several major conclusions:

- Cheating is at a rather high level, and may be increasing.
- Many students claim they are not cheating because they are using their own definitions of cheating rather than the professor's definition—this is a very post-modern view of the world.
- Just teaching traditional codes of conduct is insufficient to promote ethical conduct.
- There appears to be a correlation between traditional moral theories perspectives and cheating, with a virtue ethics perspective appearing to produce more honest students. However, this conclusion is tentative because not all students may have understood the terminology used. More work needs to be done in this area.

Recommendations:

- Recognize we have a problem and take some action to discover/prevent cheating.
    - The verbal acknowledgement and promotion of ethical behavior by faculty members in the classroom is an important step for initiating students' consideration of ethical behavior in their academic pursuits.
- Change the way we value homework and structure testing/assessments procedures, since it is clear that students will work together, regardless of what the professor's standard happens to be.
    - Consider emphasizing both the value of teamwork in the learning process but also highlight the ultimate importance of individual effort and knowledge in determining student grades.
    - Refine testing/assessment procedures that reduce or eliminate tendencies or opportunities for teaching in the classroom.
- In addition to teaching about the codes of conduct, teach a virtue ethics approach that reinforces to the students why they should make the correct choice.
    - Verbally state and model the importance of ethical behavior in the classroom.
    - Provide examples of acceptable and unacceptable actions that support ethical behavior in academe.

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