Understanding and Influencing Student Attitudes Toward Ethical Classroom Actions

Prof. Brian E Moyer, University of Pittsburgh, Johnstown

Brian E. Moyer is an Assistant Professor of Mechanical Engineering Technology at the University of Pittsburgh at Johnstown, an adjunct professor for Bioengineering at the University of Pittsburgh, and an automation consultant for Crossroads Consulting, LLC. Brian's consulting, teaching and research focus areas include hardware and GUI software integration primarily using LabVIEW by National Instruments and kinematic and kinetic data collection and analysis methods for human body movement characterization especially as related to normal and perturbed (slipping) gait. Dr. Moyer earned a BS in mechanical engineering from Carnegie Mellon in 1993, a MS in mechanical engineering from the University of Pittsburgh in 1996, and a PhD in Bioengineering from the University of Pittsburgh in 2006. Brian teaches courses in computer programming for engineers, design, measurements, and dynamics.

Dr. Randy Dean Kelley P.E., University of Pittsburgh, Johnstown

Dr. Kelley is an assistant professor at the University of Pittsburgh at Johnstown. He recieved his doctorate in Nuclear and Mechanical Engineering from Texas A&M University in 2010. Dr. Kelley's expertise and research interests are in the broad subject area of thermal sciences with a particular interest in Energy.

Mr. Richard A. Youchak PE, University of Pittsburgh, Johnstown

Instructor: Civil/Mechanical Engineering Technology, MS Industrial Admin. Purdue Univ. Presently teaching classes that use AutoCAD, Inventor, Civil 3d, Word, Excel, Matlab and MathCAD.

Understanding and Influencing Student Attitudes toward Ethical Classroom Actions

Abstract

This paper reports student responses to a short survey presented within the first few weeks of a first-term, introductory level engineering course. The purpose of this survey was to begin a dialog with students regarding ethical classroom behavior and to gain insight into baseline student attitudes regarding activities that may or may not be considered cheating. Students were anonymously asked to rank their level of agreement (or disagreement) with eleven statements related to working with others on homework assignments, using solution materials for homework assignments, and appropriate behavior for exam periods including the use of technology. Four sections of the course were surveyed using the same protocol in the fall of 2014 ($N_{2014} = 85$) and are compared herein to results obtained using a similar methodology in the fall of 2013 ($N_{2013} = 52$). Some details regarding a new ethics topic section that was added to the course in the fall of 2014, partially to address concerns that students were not matriculating with as strong an ethical foundation as desired, are discussed. The results of these student surveys will be used as input toward continuous improvement of the course and will inform efforts to address topics for future discussions.

Introduction

Many educators have sought to better understand why students cheat and have published their findings along with suggestions to help prevent cheating. Among other suggestions, researchers have proposed that using technological tools to detect cheating, setting ground rules, stressing honor codes and discussing penalties early and often are proven strategies that can positively influence student behavior. A recent article in ASEE's Connections newsletter by Mary Lord [1] discusses cheating in engineering classrooms and suggests seven methods to "ensure a productive classroom," many of which focus on the prevention of cheating.

Based on anecdotal experience and a brief survey of the literature, engineering undergraduates are clearly not immune to the pressure to gain advantage via ethically gray means [2,3,4]. Online sources of solutions to textbook problems and an ever increasing popularity of third party problem solving services ("homework helpers") have only increased the opportunity for students to avoid doing their own assignments. Grading the solution manual, over and over, is a waste of a professor's time: other than begging students not to cheat, what can be done?

Survey Description

To gain a better understanding of what students consider cheating, eighty-five first semester engineering technology students were surveyed with an anonymous questionnaire detailed in Table 1. Of the questions posed, only the responses to questions 1, 4 and 5 indicated activities that students did not consider cheating. The questions were purposefully situationally vague meaning that students were not given any details to enrich their interpretation of the questions.

Table 1: Survey questions as posed to students with categorized response totals. Students were asked to respond Strongly Agree (SA), Agree (A), Neither Agree nor Disagree (N), Disagree (D), Strongly Disagree (SD), or Not Applicable (NA). Unanswered questions were included in the NA column. Questions were worded such that SA and A responses consistently indicate activities that students considered cheating while D and SD responses indicate the opposite. The highlighted questions (Q1, Q4, and Q5) were not considered to be cheating by most students.

	Question	SA	A	N	D	SD	NA
Q1	Working on homework with another person is cheating.	1	0	8	40	36	0
Q2	Copying homework solutions from another student is cheating.	35	41	7	2	0	0
Q3	Copying from an online solution manual to solve homework problems is cheating.	23	36	18	6	2	0
Q4	Asking other students questions about homework problems outside of class is cheating.	0	0	2	27	54	2
Q5	Asking the instructor questions about homework problems outside of class is cheating	2	0	1	6	75	1
Q6	Looking at another person's test to help you solve a problem during an exam is cheating.	67	16	1	0	0	1
Q7	Allowing another student to look at your test during an exam is cheating.	58	24	1	1	0	1
Q8	Sending text messages during an exam, even if they do not concern the exam, is cheating.	17	23	24	14	6	1
Q9	Using your phone to access online materials or solutions during an exam is cheating.	62	22	1	0	0	0
Q10	Using a programmable calculator to store potential test data to be accessed during an exam is cheating.	39	33	7	3	3	0
Q11	Emailing your finished assignment to another student to help them finish their assignment is cheating.	29	39	15	2	0	0

Results and Discussion

As summarized in Table 1 and graphically illustrated in Figure 1, working with another person on homework (Q1), asking other students about homework problems outside of class (Q4), and asking the instructor questions about homework problems outside of class (Q5) were all considered acceptable behavior (Cheating: 1/84, 0/83, and 2/84 respectively) while copying homework solutions from another student (Q2) or from an online solution manual (Q3) were not (Cheating: 76/85 and 59/85 respectively). Similarly, students indicated that emailing a finished assignment to another student to help them finish their assignment (Q11) was cheating (Cheating: 68/85). If one were to take these responses at face value it would appear that students believe that talking about homework with anyone, including the professor, is acceptable while using another's work is generally unacceptable. Research by McCabe [5] suggests students are more likely to cheat on homework (40% admitting to working with others on homework) because they either don't consider such activity cheating (70%) or because they consider such cheating to be minor which seems to agree with student responses to Q1. According to

Carpenter et al. [6], almost all students realize that copying homework is cheating, in agreement with their responses to Q2 and Q3, yet more than half will have done so at least once per term.
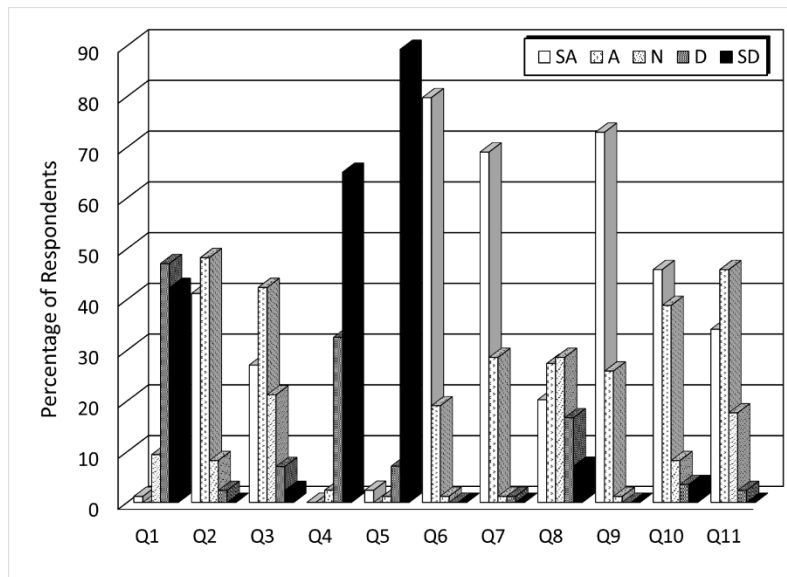

Figure 1: Student response percentages (Table 1 provides actual response counts) for the eleven survey questions. Note, only 83 students responded to Q4 (one blank response and one NA answer), and only 84 responded to questions Q5 (one NA), Q6 (one blank), Q7 (one blank), and Q8 (one NA).

The 26 of 85 students who were either on the fence or did not consider copying homework solutions from an online solutions manual cheating (Q3) supports both anecdotal and published [6] evidence that this type of behavior is viewed as acceptable by many. However, this survey was gathered from a freshman level engineering course, early in the fall term. Without guidance, it is likely that, as these students progress through higher level courses with more demanding academic requirements, many more will find that using online solution materials is an acceptable practice. A quote from Ariely [8] is cited in Ellaway [7]: "The limiting factor to the amount of cheating behavior [students] were prepared to engage in was the point at which an individual's self-esteem was diminished by the act while the chance of being caught was less of a factor." Ellaway believes that quote implies that students attempt to apply a strategic approach to maximizing gain while minimizing effort – something that most educators have likely seen in their classrooms. How then is one to increase the self-esteem cost or to reduce the gain accrued by copying solutions from online source materials, or, as is becoming more prevalent, by paying a service to solve problems?

Interestingly, only 21% of respondents to a similar question (see Q3 from Table 2) thought a similar activity was cheating in 2013 [9]. Students clearly differentiated "Accessing an online solution manual to do homework problems" from "Copying from an online solution manual to solve homework problems..." with 69.4% of current respondents (27% SA and 42.4% A) considering the latter to be cheating. The subtle difference in the wording between the two questions indicates a likely reason for such a large shift in attitude. This nuance in language implies that students believe that there is an ethical continuum of ways to use online material for homework assistance which is supported by Ellaway [7].

Table 2: A survey presented to 52 students from a first-year engineering course in the fall of 2013 yielded the following responses[9]. Note, only Yes (cheating) or No (not cheating) answers were requested for this survey and there were subtle language changes in the survey from 2013 to 2014.

	Question: Do you consider this cheating?	% Yes
Q1	Working on homework with another person.	6
Q2	Copying homework from another student.	96
Q3	Accessing an online solution manual to do homework problems.	21
Q4	Asking questions from other students about a homework problem.	2
Q5	Asking questions outside of class from the instructor about homework problems.	4
Q6	Looking on another person's test to help you solve a problem during an exam.	96
Q7	Allowing another student to look on your exam during the exam period.	94
Q8	Sending a text message during an exam even if it does not concern the exam.	77
Q9	Using your phone to access online solution manuals during exams.	96
Q10	Using a programmable calculation to store data to be accessed during an exam.	87
Q11	Emailing your finished work to another student to help them finish their work.	85

The results summarized in Table 2 from 2013 generally support the conclusions of the most recent survey (Table 1); however, Q8 received a higher "yes" percentage in 2013 than in 2014 (77% versus 69.4%) which may indicate that students on the fence in 2014 would be more likely to choose that the activity was cheating if pressed to choose yes or no.

For the survey from 2014 (Table 1), perhaps most interesting was the strength with which students responded to Q6, Q7, Q9, and Q10. All of these questions were related to acceptable exam-taking behavior. Students indicated that they realized that examinations should reflect their own work (Q6, Cheating: 83/84), that using technology during an exam to gain an unfair advantage was cheating (Q9 and Q10, Cheating: 82/85 and 72/85 respectively), and that allowing someone else to use their work was inappropriate (Q7, Cheating: 82/84). To answer Q9 and Q10, these first year students assumed that the use of technology during an exam was cheating although the prohibition of such activity had not been discussed in the course and such activity could reasonably be permitted in some courses.

The distribution of student responses to Q8 suggests a potential source of conflict between what some students consider acceptable and what professors typically prohibit. A large percentage of students (44/84) indicated that remaining socially connected during an exam via text messaging

could be acceptable behavior or at least is a gray area whereas most professors would likely consider use of a cell phone, for any reason, during an exam completely unacceptable.

This divergence deserves more thought: why do professors consider the use of cell phones during exams unacceptable? Is it because the use of cell-phone technology *could* be used for cheating and because there is no way to know what any one student *might* actually do with the technology? Professors have been forced to assume the worst and thus typically ban cell-phone use during exams just in case.

Students meanwhile have become accustomed to, some to the point of addiction, being continuously connected to their social networks. According to Roberts et al.[10] as summarized by Lord[1], student addiction to cellphone use is a serious issue - as high as 60% according to one non-scientific online survey[11]. Moreover, Roberts et al.[10] and Geser[12],[13] describe how male and female students use cellphones as more than simple communication tools – males specifically tend to see cellphones as tools and/or sources of entertainment while females tend to see cellphones as a means to stay socially connected. Is it possible that student responses to Q8 indicate that they do not think that staying connected to friends is cheating because that would imply that they, by their nature, cannot be trusted? When educators stress that cellphones are not permitted during exams, students may believe that their honor is being questioned. Perhaps they believe that they can text and take an exam simultaneously without succumbing to the temptation to use the technology for unethical gain.

Answers to Q9 notwithstanding, some students, especially more senior undergraduates, may not see using online resources as cheating because efficiently using resources to solve problems is what engineers have traditionally been taught to do. Lord[1] suggests embracing technology in the classroom to reinforce the lessons and to reduce cheating. Ellaway[7] goes even further suggesting that medical students will become practicing physicians who will undoubtedly use information prosthetics to augment their training so why shouldn't they be evaluated in school using the same tools? Similarly, practicing engineers will rarely if ever need to solve real-world problems without being able to access the wealth of knowledge now available with a few keystrokes. Would we expect engineering students to take exams without calculators (at one time the answer was probably yes)? At what point does omnipresent technology become just another tool?

Conclusion

The survey provided a starting point for a dialog with incoming students about ethical behavior which has been suggested to be one positive method to reduce cheating[14],[15]. As suggested by Lord[1], Choi[4], and others, by talking about expectations early, long-lasting boundaries can be set. The discussion spurred by this survey dovetailed nicely with material from a textbook that has now been adopted for this course which contains a chapter on engineering ethics. This book chapter includes sections related to ethical decision making, plagiarism, the Code of Ethics for Engineers (via the National Society of Professional Engineers), specifically the Engineer's Creed and the Fundamental Canons of the Code (http://www.nspe.org/resources/ethics/code-ethics), as well as numerous in-class discussion activities.

In addition to taking the survey and reading and discussing topics from the new textbook, other professional engineering societies' ethical guidelines (e.g., the ASME ethics code) were reviewed and discussed in class. Ethical concepts were further emphasized via in-class

discussions of the institution's academic integrity guidelines, including both student and faculty obligations and the procedures that must be consistently followed within the college should unethical behavior be discovered. This last activity has been suggested by many (Choi [4], Lord [1], Carpenter [6], Gallant et al., [16] and Jordon [17]) as a viable means to reduce the likelihood of cheating.

The survey obviously provided insight into student attitudes that will inform future efforts to guide students toward appropriate behaviors moving forward. Specifically, based on the survey results (and research done to prepare this manuscript), additional topics for discussion have been identified including student attitudes about the use of cell-phones in the classroom and nuances related to the use of on-line resources supporting homework and exam activities. These topics will become a larger part of the conversation. Finally, it is hoped that this same survey will be administered year-to-year to assess how student attitudes change throughout their educational experience and to keep the conversation fresh and ongoing.

References

1   Mary Lord, "Driven to Distraction", in *Connections* (ASEE, Washington, DC 20036, 2014), Vol. November.

2   Jeffrey Selingo and Selingo Jeffrey, "The Cheating Culture," ASEE Prism 14 (1), 24 (2004).

3   M. Srikanth and R. Asmatulu, "Modern cheating techniques, their adverse effects on engineering education and preventions," International Journal of Mechanical Engineering Education 42, 129+ (2014).

4   Charles O. Choi, "The Pull of Integrity," ASEE Prism 18 (7), 28 (2009).

5   Donald L. McCabe, "It Takes a Village: Academic Dishonesty & Educational Opportunity," Liberal Education 91 (3), 26 (2005).

6   Donald D. Carpenter, Trevor S. Harding, Cynthia J. Finelli, Susan M. Montgomery, and Honor J. Passow, "Engineering students' perceptions of and attitudes towards cheating," Journal of Engineering Education 95 (3), 181-194 (2006).

7   Rachel Ellaway, "eMedical Teacher," Medical Teacher 35 (6), 526-528 (2013).

8   Dan Ariely, "Predictably irrational: the hidden forces that shape our decisions," (Harper, New York, NY, 2009).

9   R. Kelley and B. Dooley, presented at the Ethics in Science, "Technology and Engineering," 2014 IEEE International Symposium, 2014 (unpublished).

10   James A. Roberts, Luc Honore Petnji Yaya, and Chris Manolis, "The invisible addiction: Cell-phone activities and addiction among male and female college students," Journal of Behavioral Addictions 3 (4), 254-265 (2014).

11   Shep McAllister, "Infographic: Generation Mobile", (http://www.hackcollege.com/blog/2011/10/31/generation-mobile.html, 10/31/11), Vol. 2014.

12   Hans Geser, "Is the cell phone undermining the social order?: Understanding mobile technology from a sociological perspective," Knowledge, Technology & Policy 19 (1), 8-18 (2006).

13   Hans Geser and Késia U. e S. Trench, "Are girls (even) more addicted? Some gender patterns of cell phone usage", (Sociology in Switzerland: Sociology of the Mobile Phone. Online Publications., Zuerich, http://socio.ch/mobile/t_geser3.pdf, 2006), Vol. 2014.

14   Phillip Wankat and Frank Oreovicz, "Keeping students honest," ASEE Prism 12 (1), 40 (2002).

15   Joe Kerkvliet and Charles L. Sigmund, "Can we control cheating in the classroom?," The Journal of Economic Education [H.W.Wilson - EDUC] 30 (4), 331 (1999).

16   Tricia Bertram Gallant, Lelli Van Den Einde, Scott Ouellette, and Sam Lee, "A Systemic Analysis of Cheating in an Undergraduate Engineering Mechanics Course," Science and Engineering Ethics 20 (1), 277-298 (2014).

17   Augustus E. Jordan, "College Student Cheating: The Role of Motivation, Perceived Norms, Attitudes, and Knowledge of Institutional Policy," Ethics & Behavior 11 (3), 233-247 (2001).