Use of Phones and Online Tutors to Cheat on Engineering Exams

Randall D. Manteufel, Amir Karimi
Mechanical Engineering Department
The University of Texas at San Antonio

Pranav A. Bhounsule
Mechanical and Industrial Engineering Department
University of Illinois at Chicago

Abstract

There has been an increase in cheating on exams by engineering students using phones. In the past, it was known that students used phones to search for solutions to problems, often from publisher solution manuals. Now, students have been caught taking pictures of exam problems and uploading them to online tutors. The tutors are often located in different parts of the world. It appears a number of tutors are available at any time of the day, and will promptly solve the problem and send the solution back to the requestor. To help instructors, this paper describes this method of cheating. Once this method of cheating was understood, the authors of this paper were able to collect sufficient evidence to pursue scholastic dishonesty charges against students after the semester had ended and after the students had been assigned a passing grade in the class. The recommended sanction for cheating on an exam is a failing grade in the class, hence some students have been shocked to have been caught and then shocked to have to retake a class even after they have progressed to take follow on classes in the engineering program. If faculty understand how a student can cheat using a phone on exams, they are better prepared to deter, detect and prosecute cheaters.

Introduction

There are more online resources that engineering students use to help them pass classes. Some of the popular sites are Chegg[1], CourseHero[2] and StudySoup[3]. These services have a monthly subscription fee, have extensive compilation of solved problem and have online tutors. There has been a natural progression of how students use the internet. Internet study tools such as Chegg started out to help students solve problems and have been used by students to copy homework solutions so that faculty have changed how they assign, collect and grade homework.[4] The use of Chegg to complete homework has encouraged departments to recommend relatively low weights to homework[5,6]. Some students have a blurred idea of what is academic dishonesty, especially on homework[7]. In many places, homework is not a substantial part of the grade so it is acceptable to receive online help on homework.[8] Some instructors avoid traditional homework and use projects to assess student learning, yet it appears the online tutors are available to not only solve problems but write papers and laboratory reports. There appears to be a growing market for online tutoring services to help students solve problems and write reports.

Cheating on exams using an online tutor is simple. The student takes a picture of the exam problem,

uploads it using an APP on the phone to online tutors and then awaits notification when the problem is solved. Using a phone to cheat on exams is not new[8,9], it is just that there are now a suite of online tutors often on the other side of the world waiting to solve problems. And they are cheap.

Academic misconduct is rampant in engineering program, especially if instructors receive no incentive to guard the academic integrity of the program and are unsupported when students fight back, often accusing the instructor of being biased or racist. The amount of effort to prosecute cheating and the negative repercussion when a student makes counter claims shouldn't be overlooked. Pursing cheaters can become a dreaded part of a teacher's responsibilities.[9,10] With this paper, we hope to encourage more instructors to take precautions to reduce the risk of cheating and also encourage instructors to pursue scholastic dishonesty charges when cheating is found. As unpleasant as it may be, turning a blind eye to cheating is not recommended.

Example of Student Cheating

Figure 1 is an image from Chegg of a problem submitted by a student. In this case, the student began working on the problem then snapped the photo and uploaded to online tutors. The instructor is a subscriber to Chegg and can search the vast online database of solved problems. The instructor typed in the first few works of each exam problem doing a manual search to see if any exam problems were posted. The instructor found the posting and a solution to the problem. In some cases, multiple online tutors solve the same problem, so this can be time consuming to review all the solutions. No time stamp and no identification of the requestor is available, so it can be challenging to identify the student. Because this student began working on the problem and then posted it, it was easier to identify the student. A total of 145 students took the exam but only one had the same unique handwritten marks on an exam that was turned in that matched those in Figure 1.

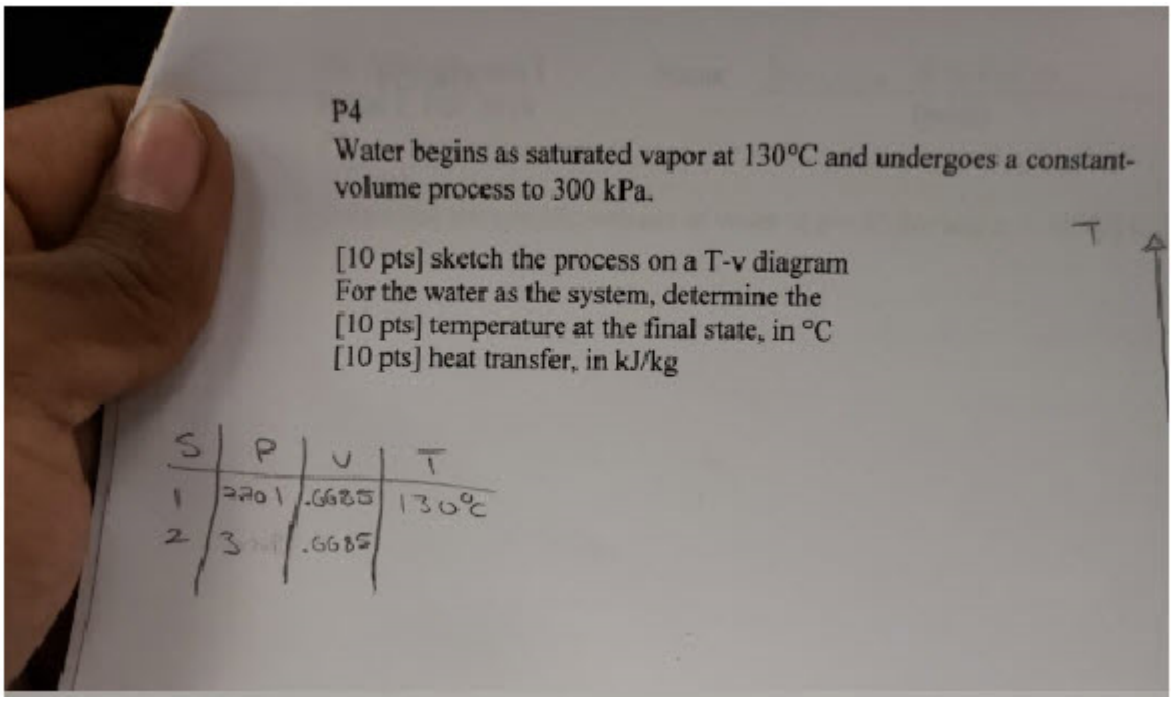

Figure 1: Problem from Thermodynamics Exam in Fall 2019 uploaded to Chegg.

After searching through the exams, a match was found and is shown in Figure 2. It is uncertain how long it takes before a solution in Chegg is available to other Chegg subscribers. It appears the requestor gets a solution within minutes with notification on the phone as advertised on the Chegg webpage. If an instructor is searching for evidence of cheating, it may take a few days before a solution pops-up in the Chegg database. Hence, the instructor has been scanning and creating PDF files of all student exam solutions to keep as a record in order to go back and compare weeks or months after the exam. The student in Figures 1 was relatively naïve because the picture posted to Chegg has very distinctive marks. Most students are more careful and take pictures of only clean exam problems.

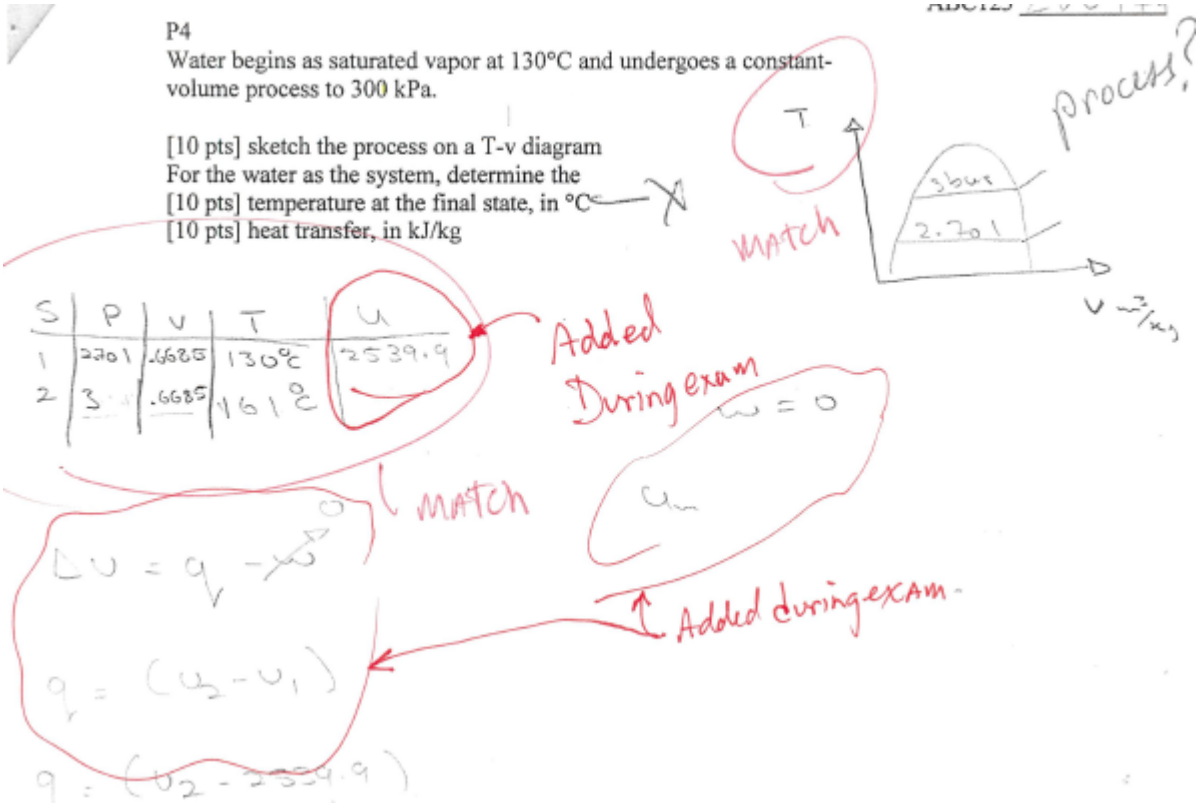

Figure 2. Copy of student work turned in at the end of the exam that matches posting to Chegg.

Importance of Scholastic Dishonesty Policy in the Syllabus

During exams, the class has a strict no-phone/no-electronics policy that is described in the syllabus and an abbreviated version is included on the front page of each exam:

> No communication device (such as phone, smart watch, computer, unapproved calculator) on your body (in hands/clothing/pockets) or within reach (on your seat, between your legs, under your seat, on the seat next to you) during exams. It is considered cheating to have a phone, computer, or other electronic device (other than approved calculator) accessible during an exam.

The instructor doesn't need to catch the student with the phone taking the picture and uploading it during the exam. In fact, the teacher didn't catch the student with the phone during the exam shown in Figure 1. It is remarkable how students are able to take pictures and upload them without being seen, since the teacher is vigilant in monitoring the classroom. When there are over 100 students taking the exam, it is understandable how a phone can be used yet not seen. Regardless, the evidence was that the student used a phone (or some electronic device capable of taking a picture) to take a picture of an exam problem and post it to the online tutors during the exam. The student was charged with scholastic dishonesty with the recommended penalty as outlined in the syllabus:

> Cases of suspected scholastic dishonesty during an exam will be prosecuted through the UTSA Office of Student Life, with the recommended penalty that the student receive an "F" grade for the class.

The "Student Conduct and Community Standards" Office at the University prosecutes scholastic dishonesty cases which are filed by the instructor. The office expects clear statements in the syllabus about what is allowed and not allowed on homework and on exams. Likewise, it helps if the syllabus contains clear statements about the recommended penalty when scholastic dishonesty is suspected. Being upfront and clear about these details is very important before a case is filed.

Brazen Students

Figure 3 is from a Dynamics course exam during the Summer 2019. The student has raised the exam to take a picture. If the exam lies on the desk, there is often a shadow of the hand/phone on the exam, which makes it hard to read. So it appears the student holds the exam up for better lighting to avoid shadows. The picture catches the back of the Teaching Assistant (TA) in the upper edge the photo. The TA appears to be walking away from the student taking the picture. The TA remembers being vigilant and walking around the classroom during the exam. It appears the student waited until the TA walked by, then snapped the image. This shows the brazenness of some students. It is hard to imagine that other students in the room don't witness this type of cheating. They most likely do and students appear to only try to hide it from the instructor/proctor. Having spoken with numerous students, they are hesitant to tell on another student. This is hard to understand since cheating does hurt the honest student who may be in jeopardy of failing a class or earning a lower grade. There have been recent examples where students have earned "A" grades on exams and an overall "A" grade in the class and then have been found to have cheated extensively on homework and exams. Teachers often curve an exam based on the range of scores, and if a few students did well, then the exam may not be curved. In some cases, cheating has been so extensive that it appears all of the high grades were dishonestly earned. As students see other students cheat and get away with it, more engage in cheating. This results in a culture where cheating becomes dominant and there is little fear of being turned-in by other students. The brazenness of cheaters is stunning given they do not think they will be caught and if they are caught, they believe they will receive no meaningful penalty. This has created a climate where cheaters are surprisingly bold.

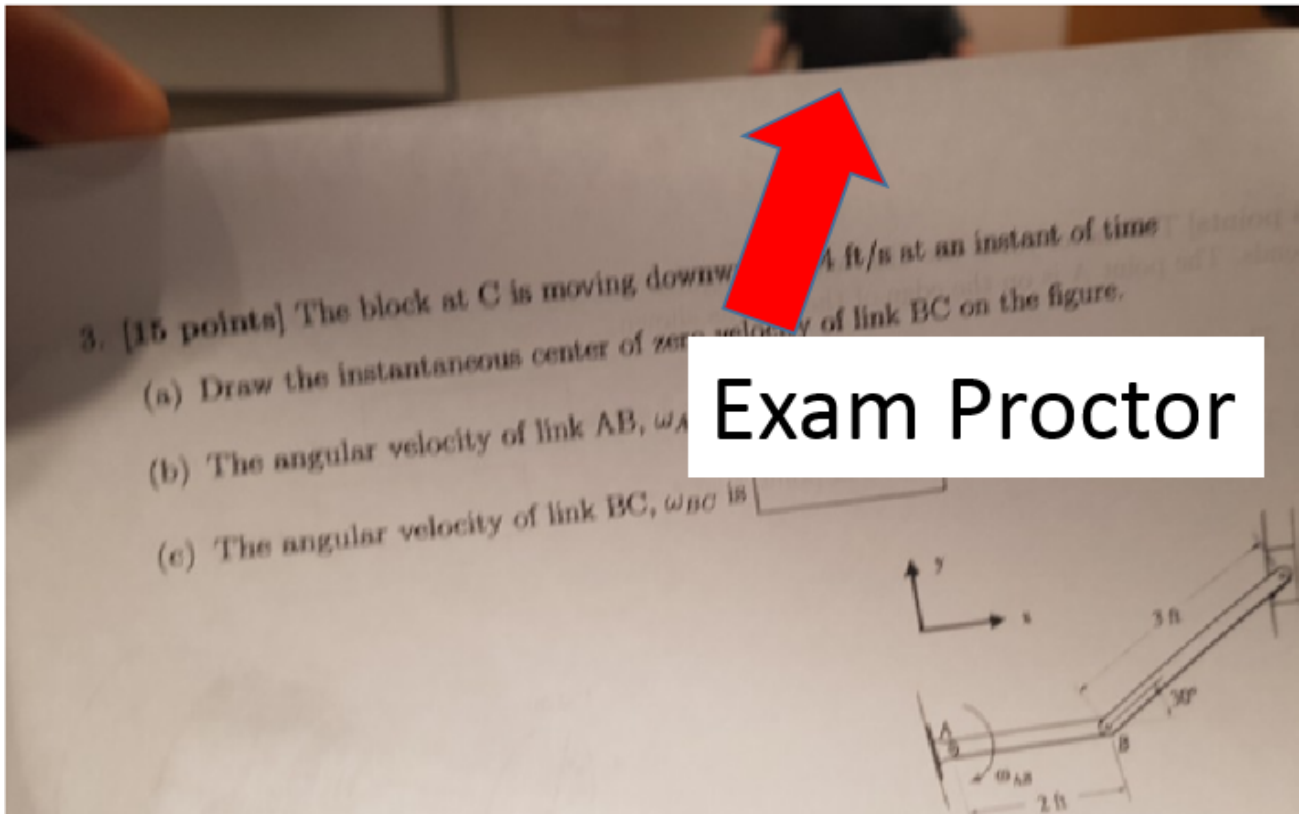

Figure 3. Photo posted to online tutors showing the back of the exam proctor in upper edge.

Posting without Unique Marks

The problem in Figure 3 posted to Chegg has no unique marks on the exam that will match it back to an individual student. Since this student was not caught using the phone during the exam, the only way to charge the student with cheating is to show the work on the exam was copied from a Chegg solution. For this problem, there was no unique matches with strong enough evidence to support a charge of scholastic dishonesty.

Matching a student's solution to a Chegg tutor solution is very time consuming. If the Chegg tutor is correct (which they often are) and the student's solution is correct, there is little evidence of cheating. The only evidence would be the steps taken, symbols used, or writing of intermediate/final values. The teacher can be very suspicious but there may not be enough evidence to make a solid charge of scholastic dishonesty. Many students have defended themselves by claiming the similarities are coincidental and some students have made counter allegations that the instructor is biased or racist. The authors of the paper do not pursue scholastic dishonesty cases unless there is overwhelming evidence. The strongest evidence is when the Chegg solution has an error and the student copies the error.

Timing of Chegg Solution

Once a problem is posted to Chegg in a particular subject area, there are often a number of tutors online ready to solve the problem. Each tutor has just a few minutes to decide if they want to commit to solving the problem and then are tracked by how quickly they solve the problem and the user feedback on their solution. So, the tutor works quickly and accurately, since they want high feedback rating. During an exam, there is often a race against the clock. The student posts the problem, but doesn't know when the solution will be available. One often finds the poster will add a comment like "PLEASE SOLVE SOON AND COMPLETELY" and "URGENT! PLEASE SOLVE IN 30 MINUTES". In some cases, the online solution arrives too late. This is more common for shorter exams. In spring/fall semesters, classes are typically either Monday-Wednesday-Friday or Tuesday-Thursday, having 50-minute exams or 75-minute exams, respectively. It is harder to cheat on shorter exams. In the summer, the classes are 115 minutes long and there have been many more cases detected in the summer.

Figure 4 shows a part of a student exam where the problem was posted to Chegg and while waiting, the student worked on the problem. Before the exam ended, the Chegg solution became available. The student crossed-out his work and went to a clean sheet of paper to copy the Chegg solution. The work was a strong copy where it appears the student was rushed for time hence didn't try to mask the copy by making subtle changes to the flow of calculations, or the boxing of intermediate calculations, or the way of representing values with units. When a grader sees the crossing-out of work and complete new approach to a problem, this is a red flag that the student received help during the exam.

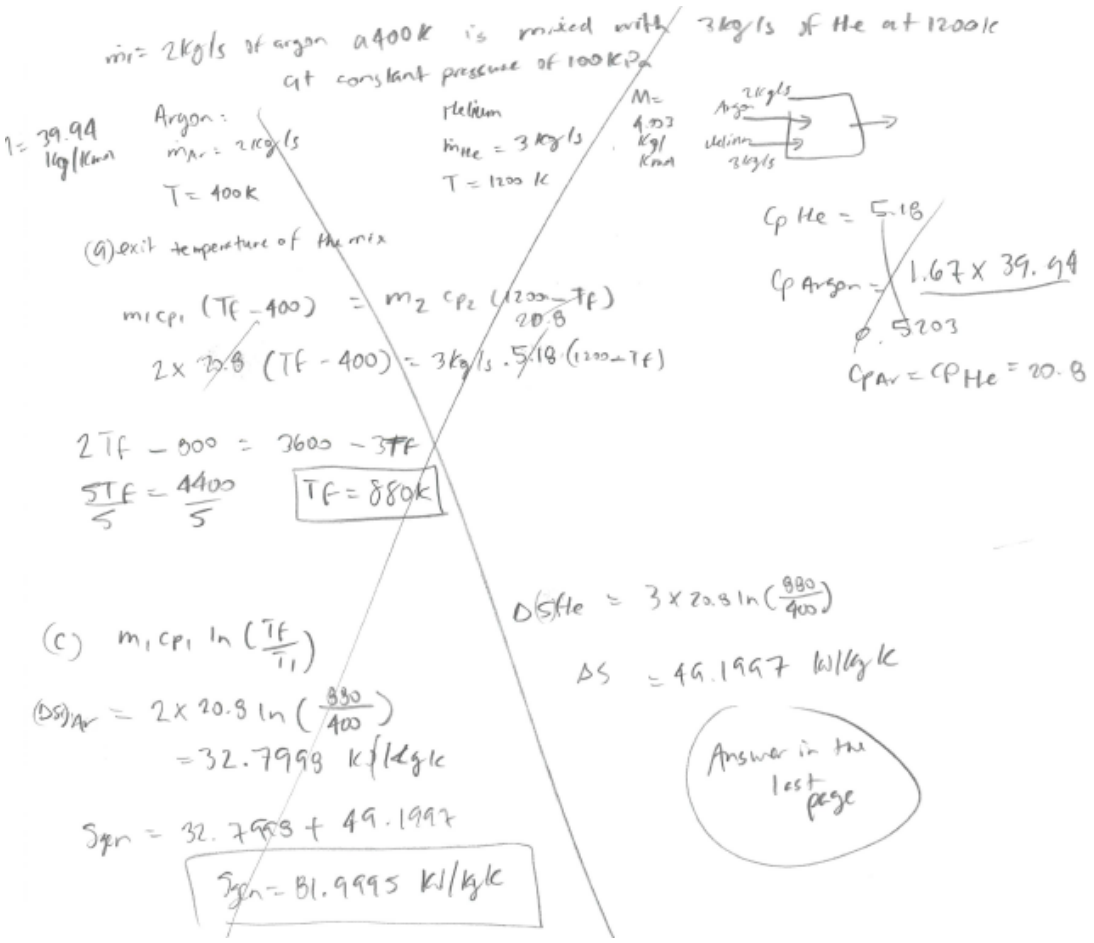

Figure 4. Student work on an exam problem that was crossed-out and "Answer in the last page"

Faculty Response to Cheating

There is strong evidence of online cheating in the majority of mechanical engineering classes taught in the summer 2019 at the author's university, yet there were no scholastic dishonesty cases filed in the summer. After this method of cheating was understood by the authors, the authors requested exams used by other instructors during the summer 2019. A total of four classes were reviewed and cheating was identified in each class. In most classes, all of the exam problems had been posted to Chegg and they appear to have been posted during exams. Those that were not posted were clear textbook problems, hence the student didn't need an online tutor. The solution was readily available.

The responses from each faculty member was unique and often surprising. Here is a brief summary of each.

One instructor was retired and had been teaching one class per semester. All exam problems were posted to Chegg by students. Clear marks on the posting would allow the instructor to identify the

student(s). However, the instructor believed no one cheated during the exams because the instructor proctored the exams. When evidence was shared with the instructor, the response was disbelief followed by disgust. The instructor had received low student evaluations of teaching and had been increasingly disappointed in student attitudes in recent years. The instructor decided to stop teaching. The instructor was not an employee in the fall 2019 semester and did not want to pursue scholastic dishonesty charges. When asked for copies of the exams, the instructor said the exams were inadvertently thrown away in a recent cleaning of the office. The instructor destroyed the evidence. Hence the department could not pursue charges against any student. Upon reflection, this faculty member had taught for over 30 years and apparently never pursued a scholastic dishonesty case following university policies. Maybe it was just too much work.

One instructor had a full-time job at a local company and teaches one course per semester as a part-time instructor. Part-time instructors don't teach because of the money. They are paid less than the PhD student who is assigned as a teaching assistant to the class. In general, the part-time instructor is not interested in policing the students and doing the unpleasant work of pursuing scholastic dishonesty cases. The typical part-time instructor knows they are paid less that the teaching assistant, so they often give the TA responsibility to write, proctor and grade the exams. The instructor didn't have time to identify cheaters or learn the rules-and-regulations of the University to file scholastic dishonesty cases. In fact, in over 20 years of teaching, the authors can recall no part-time instructor that has filed such charges against a student. This part-time instructor was willing to make the charge against the student, as long as documentation was collected and compiled by another full-time faculty member.

One instructor accepted a new faculty appointment at another University. He expressed disbelief that anyone cheated on their exams. He provided access to exams and allowed another full-time faculty member to prepare the documentation and charge the students with scholastic dishonesty on behalf of the department. The teaching assistant for the class (who is in Figure 3) was very helpful in reviewing evidence and preparing documentation, yet had also left the university since he graduated at the end of the summer.

One of the authors of this paper also taught a class in the summer 2019. Significant effort has been spent trying to understand how students cheat on exams using online resources. For cheating on exams, the instructor filed 3 scholastic dishonesty cases from Spring 2019, 2 cases from Summer 2019, 2 cases from Fall 2019. The perception is that the University/College/Department assumes that all faculty are committed to upholding academic integrity standards. Because the University/College/Department assumes that everyone is doing their job then everyone must be doing their job. If there are no cases of scholastic dishonesty filed, this must mean the students are not cheating. In fact, the perception is that if there is a lot of scholastic dishonesty cases being filed by an individual faculty member, there may be a problem with that faculty member. Likewise, if a faculty member has no scholastic dishonesty cases, they are doing a great job.

Conclusion and Recommendations

If faculty are aware of how students use a phone to take a picture of an exam problem and submit the problem to online tutors, then they are better prepared to prevent this type of cheating. In conclusion, here are some recommendations.

1. Do not use a problem from a textbook for an exam problem. If the problem is from the textbook, the solution is already available online. Having reviewed the exam problems used by multiple instructors, it is too common to use textbook problems. Even if the problem is from a different textbook than the one being used in the class, the solution is readily available online.

2. Check your exam problems before you give the exam. Do a google search or do a Chegg search (if you are a paid subscriber). If you can find the solution online, don't use the problem or revise the problem.

3. Do not use old exam problems since they are probably online. This can be very discouraging to instructors. It takes lots of time/effort to make exam problems. Instructors like to reuse exams to help gage student learning from year-to-year. But one should check to see if old exams are available online.

4. Save scanned copies of student exams. You might find evidence of cheating after you have returned the paper copy of the exam to the student. But be careful, some students will get back an exam and want to see how to solve a problem. So, they submit it to Chegg. This is not scholastic dishonesty. They are just looking for a solution. It can be confusing to see these postings mixed with other postings, since there is no time-stamp on submissions and/or solutions.

5. Have a no phone/electronics policy in your syllabus. Have a clear statement of recommended penalty if charged with scholastic dishonesty. Your department should have uniform policies so all instructors can adopt, and the students become accustomed to the same rules for all engineering courses in your college/department.

6. Faculty need to look at better methods to enforce the no-phone/-electronics policy during exams. The challenge is that some cheaters are so brazen that their phone is hidden of their body and no teacher wants to "pat down" a student. Faculty have proposed using a hand held wand metal detector, but are uncertain if this would somehow be an invasion of student privacy.

7. When students cheat, prosecute them. If more faculty prosecute cheaters, it will discourage cheating. It appears that some instructors will repeatedly ask the student to stop cheating, but never pursue charges of academic dishonesty. Many students are in disbelief when confronted with the actual charge of scholastic dishonesty because so few faculty will confront a student with such a charge.

8. Cheating on exams with phones and online tutors will most likely become more widespread. There are a number of new online tutoring services. To find some, google "online tutor for engineering". Chegg is currently the most widely used by students. In the future, it will probably offer private online tutors, so that others will not be able to see what one student posts to a tutor.

9. Some students will cheat and more students will cheat if others students get away with it. The reputation of the program/college/university will suffer where cheating is prevalent. Some faculty pretend cheating doesn't exist or believe cheating only hurts the cheater. Some faculty use many excuses to not pursue cheaters. Cheating hurts everyone, especially the borderline D/C student who doesn't benefit from a curve because some cheaters "aced" the exam and fooled the instructor into believing the exam was more doable that it really was. Cheating also hurts the honest student who graduates from an engineering program that has a reputation of being full of cheaters. Potential employers have opinions about the reputation of different engineering programs. Cheating is like a cancer. It can spread quickly and it has serious long-term consequences.

References

1. Chegg, https://www.chegg.com/study, accessed 1/10/2020
2. Course Hero, https://www.coursehero.com/, accessed 1/10/2020
3. StudySoup, https://studysoup.com/ , accessed 1/15/2020
4. Bierman, E. K., & Wood, T. A., & Plumblee, J. M., 2019, "Student and Faculty Perspective and Survey Results on an Innovative Homework Process", ASEE2019-25233, Tampa, FL, June 16-19
5. Manteufel, R.D., and A. Karimi, 2019, "Impact of Department-Level Teacher Workshop on Reducing Student Complaints", ASEE Annual Conference, ASEE2019-26575, Tampa, FL, June 16-19
6. Manteufel, R.D., and A. Karimi, 2012, "Assisting Adjunct Faculty Using Committee Exams", ASEE Annual Conference, AC2012-4742, San Antonio, TX, June 10-13.
7. Ryan, T., B. Steffensen, and C. Janeiro, 2017, "Curing the Cheating Epidemic? A Multi-site International Comparison of Perspectives on Academic Integrity and the Way we Cure by Teaching" ASEE2017-19706,
8. Shepard, T., A.B. Hoxie, and M. Anderson, 2014, "I Did Not Anticipate This: Experiences for the Early Years", ASEE Annual Conference, ASEE2014-9506, Indianapolis, IN, June 15-18.
9. Luks, C.P., 2012, "My War on Cheating", ASEE-Midwest Annual Conference, Rolla, MO.
10. Khalid, A., B. Stutzmann, M.L. Lowder, M.M. Atiqullah, R.Singh, C.A. Chin, 2014, "Academic Misconduct – What Students Think and a few Case Studies", ASEE Annual Conference, ASEE2014-9566, Indianapolis, IN, June 15-18.

RANDALL D. MANTEUFEL

Randall Manteufel is an Associate Professor of Mechanical Engineering at The University of Texas at San Antonio (UTSA). He has won several teaching awards, including the 2012 University of Texas System Regent's Outstanding Teaching Award and the 2013 UTSA President's Distinguished Achievement Award for Teaching Excellence, the 2010, 2014, 2018 and 2019 College of Engineering Student Council Professor of the Year Award, 2008 Excellence in Teaching Award for College of Engineering, and 2004-2005 Mechanical Engineering Instructor of the year award, 1999 ASEE-GSW Outstanding New Faculty Award. Dr. Manteufel is a Fellow of ASME with teaching and research interests in the thermal sciences. In 2015-2016, he chaired the American Society for

Engineering Education Gulf Southwest section and in 2018-2019 he chaired the Academy of Distinguished Teaching Scholars at UTSA. He is a registered Professional Engineer in Texas.

AMIR KARIMI
Amir Karimi is a Professor of Mechanical Engineering at The University of Texas at San Antonio (UTSA). He received his Ph.D. degree in Mechanical Engineering from the University of Kentucky in 1982. His teaching and research interests are in thermal sciences. He has served as the Chair of Mechanical Engineering (1987 to 1992 and September 1998 to January of 2003), College of Engineering Associate Dean of Academic Affairs (Jan. 2003-April 2006), and the Associate Dean of Undergraduate Studies (April 2006-September 2013). Dr. Karimi is a Fellow of ASEE, a Fellow of ASME, senior member of AIAA, and holds membership in ASHRAE, and Sigma Xi. He has served as the ASEE Campus Representative at UTSA, ASEE-GSW Section Campus Representative, and served as the Chair of ASEE Zone III (2005-07). He chaired the ASEE-GSW section during the 1996-97 academic year.

PRANAV BHOUNSULE
Pranav Bhounsule is an Assistant Professor of Mechanical Engineering at the University of Illinois at Chicago (UIC) since Fall 2019. He was an Assistant Professor of Mechanical Engineering at the University of Texas at San Antonio (UTSA) from Fall 2014 to Fall 2019a. He received his Ph.D. degree in Mechanical Engineering from Cornell University in 2012. His teaching and research interests are in dynamics, controls, and robotics. He is a member of ASME. He won the second best paper award at ASEE GSW 2018.