ChE views and opinions

CHEATING-AN OUNCE OF PREVENTION

... or the Tragic Tale of the Dying Grandmother

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Note: The material in this paper was presented at an orientation program given by North Carolina State University to new faculty members and teaching assistants. The formal misconduct procedure discussed in response to Question 12 of course varies from one university to another, but the philosophy underlying the procedure is relatively standard.

IN THESE PAGES, I talk about cheating—how to minimize its occurrence (preventing it completely is generally too much to hope for), what to do when you suspect it, and what to do when you can prove it. I don't claim to be an expert on the topic—I'm not sure there is such an animal—but will simply offer a few ideas for consideration. Ultimately, all instructors must develop their own philosophies on cheating, based on their individual senses of justice, morality, and humor.

Here, then, are some questions a course instructor might ask about this uncomfortable subject, and some suggested answers.

1. *I'm going to be teaching a (small, large) (undergraduate, graduate) course. Is there likely to be cheating?*

Yes.

It may reflect the spirit of our times, or a decline in student morality, or the unchanging nature of the human species, or anything else you choose to see in it. The sad fact is, however, that as long as grades are important to students—as they probably always will be—some students will do whatever they can to get the highest possible grades.

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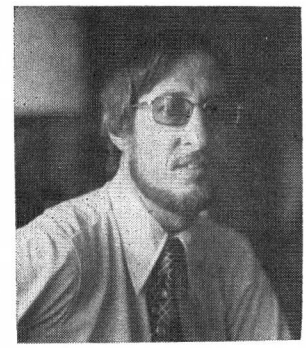

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Clearly, the likelihood of cheating varies from one classroom situation to another. If you are teaching an advanced graduate course with eight excellent students, it is probably safe to leave the room during a test. On the other hand, if you teach a sophomore course with 200 students in a room that seats 200, and no one cheats or attempts to do so, you should nominate the class for the Guinness Book of World Records.

You may as well resign yourself to the fact that some students, impelled by desperation or a flexible moral code, will try to beat whatever system you impose, and guide yourself accordingly.

2. *Why should I be all that concerned about cheating?*

Most obviously, when students cheat and get away with it, it penalizes honest students, in some cases forcing them to cheat as well just to remain

competitive. More than this, however, it cheapens the value of the degree and adds to the probability that students will be officially declared qualified in fields in which they have no competence whatever. These incompetents could end up building our bridges, designing our nuclear reactors, removing our appendices, and possibly most serious of all, teaching our children.

3. What forms does cheating take?

There are two major categories: (a) cheating on homework and (b) cheating on tests. I'll take them up in turn.

4. How do students cheat on homework?

Cheating on homework involves getting solutions from somewhere other than one's own head, and turning them in as original. The sources include other students' solutions (either stolen or freely shared), back solutions in files (popular among fraternity members), and stolen textbook solution manuals. These are all traditional sources, known and loved for generations.

The current generation's contribution to the field is the stolen computer file. Instructors who store homework solutions on hard disks (as opposed to personal floppy disks) never know when some budding software wizard with an eye toward academic or financial gain might gain access to their files and copy and possibly reproduce and sell the solutions. Also, when the assignment involves writing a computer program, copying another student's solution file is often a trivial exercise for someone who knows his way around an operating system.

5. How should I deal with homework cribbing?

One way is to change the assignments each time the course is given, so that back files become useless. This imposes a tremendous additional work load on the instructor, however, and in the case of such things as laboratory courses may be impossible.

The instructor or grader can go through all the papers, looking for sets of identical solutions. However, it is difficult or impossible to prove anything in such cases. Students can always claim that they worked independently and coincidentally came up with identical answers, and you have no way of disproving them. If a student hands in a photocopy of a page from the solution manual, you would of course have a pretty good case against him. However, the chances are that anyone that stupid will probably flunk out in the natural course of events, so that no extraordinary action may be called for.

My own solution for this problem is relatively simple, although it is strictly applicable only to technical courses. To the greatest extent possible, *eliminate the requirement that homework be done independently.* In fact, I always encourage students to work together, although I require them to hand in their own solutions. By working with others, students often learn how to solve problems that would have stumped them as individuals.

Of course, some students will get free rides this way, simply copying solutions without understanding them. However, these students will almost invariably be weeded out by the course tests. To be assured of this, include material of the type in question on the tests; ask questions about the conduct of the experiments and the analysis of data in laboratory courses, and give brief programming exercises in courses that involve computer homework.

On almost every test some students will not show up and will later appear in your office with stories that will astound you with their inventiveness, pathos, and sheer chutzpath.

6. How do students cheat on tests?

Let me count the ways.

- **THE SNEAK PREVIEW: Students get copies of the test before it is given, and come to class with the solutions already worked out.**
- **THE EYES HAVE IT: They copy from neighbors' papers—usually those adjacent or in the row ahead, sometimes in the row behind. (The latter requires more agility than the average engineering student possesses, and sometimes results in severe whiplash.)**
- **THE NOTE OF PRECAUTION: They copy from prewritten slips of paper, notebook covers, or easily accessed portions of their epidermis.**
- **THE CALL OF (A WARPED) NATURE: They go out of the examination room during the test, ostensibly to the bathroom, and either look up the answers or get by with a little help from their friends.**
- **QUICK CHANGE ARTISTRY: They pick up worked out solutions intended for distribution after the tests have been collected, and hastily correct their own solutions before handing their papers in. Since most studnts taking a test invariably wait until the last second to hand their papers in, and the**

instructor is usually distracted by the mob around the front desk at this point, he can easily miss the student in the middle of the crowd pulling this particular stunt.

- **NOW YOU SEE IT, NOW YOU DON'T: They don't hand in their test at all if they feel they have done poorly, then claim the grader lost it.**
- **THREE-PAGE MONTE: They substitute correct solutions for incorrect ones after the graded tests have been handed back, and claim that the grader made a mistake.**
- **HISTORY REPEATING ITSELF: They memorize solutions to previous examinations and simply write them down when the same questions reappear.**

Any instructor lazy enough to use the same tests semester after semester invites the last of these activities. I do not consider it cheating, but a legitimate exercise for the enterprising student. The other methods cited above are a different story, however. As much as possible must be done to guard against them.

7. How do I prevent cheating before the examination?

The key word is security.

- **Don't leave a copy of the test on your desk, or on your secretary's desk, or stored in your word processor where someone else can get access to it, or on the photocopy machine, or in a wastebasket in your office or the department office.**
- **When work is not being done on the test, keep all existing copies locked away in a safe place, like your personal file cabinet.**
- **Don't let work-study students photocopy a test—do it yourself, or have your secretary or teaching assistant do it, and immediately seal the copies in an envelope or folder and lock them away.**
- **Know how many copies were run off, and count them before the test is given. If the count is wrong, make up a new test, or see the following story.**

A professor in our chemistry department once gave a test for which the answer page was the test paper. Before giving the test, he counted the copies, and found that he was short by two. He took the papers to the department office, used a paper cutter to remove about 1/8 inch from the bottom of each sheet, and then gave the test. Afterwards, he collected the solutions, stacked them vertically, pulled out the two that were longer than all the others, and invited the students they belonged to into his office for a little chat. I don't know what happened from there, but you get the point.

8. How can I minimize cheating during the examination?

- **Most obviously, by keeping your eyes open. Be sure the examination is proctored at all times, and be on the lookout for suspicious behavior. (Keep the cold hard staring to a minimum, however—too much of a police-state atmosphere can intimidate students to a point that they become incapable of showing what they really know.)**
- **If there is room, request that students sit in alternate seats. If this is not possible, and if you have reason to believe that copying may be a problem in a particular class, you may find it convenient to make up and distribute alternate versions of the test to adjacent students. (Shuffle the order of the questions, or use different sets of numbers if calculations are involved.)**
- **If someone's eyes are obviously wandering during a test, silently call his attention to the fact that he is being observed. If you can't catch his eye, you might announce (humorously, if you can manage it) that group solutions will not be accepted, and look pointedly at him when he looks up. In extreme cases, you can quietly ask him to move to a more isolated location.**
- **Don't hand out worked-out solutions until you are absolutely certain you have collected all the test papers. One way to guarantee this is to hand them out in the period following the one in which the test was given.**
- **Before grading the papers, log them in, so you will know immediately who did not submit one.**

9. How can I minimize cheating after the examination?

- **If possible, use examination booklets, so that substitution of corrected pages for original ones is made more difficult.**
- **Make copies of all graded solution papers, or of some of them if there are too many to copy them all, before handing them back. Then, if a student comes to you and complains that the grader made a mistake, comparing his paper with the copy will tell you whether he was really misgraded, or whether he's trying to pull the old switcheroo on you.**
- **Note the names of all students who present questionable claims of misgrading. If you can't disprove their claims, give them the benefit of the doubt, and change their grades—but on subsequent tests, be sure to copy their graded solutions before handing them back, even if you copy no others.**

10. Does the type of test determine how likely students are to cheat on it?

To a considerable extent, yes. The tests which are most likely to be cheated on are those with answers that are easy to copy (e.g. true-false and multiple choice tests), and those which seem unfair to the students. Generally speaking, if you want to construct an engineering course test that is both pedagogically sound and difficult to cheat on, I recommend the following:

- **Require full problem solutions, not just simple answers, and be liberal with partial credit.**
- **Give only open-book tests.**
- **Give tests that are easy to read and possible to solve.**

If the answer to a question is "true" or "(d)" or 675°C, it is a trivial matter to ascertain this fact from the adjacent student and get full credit, while on a problem that takes several pages to work out the cheater's task is much more arduous. Requiring detailed solutions and giving partial credit makes life more complicated for the instructor and the graders, but it helps assure that students who understand the course material are not unduly penalized for careless mistakes, and it minimizes the chance of a student getting full credit for copying a correct answer without having the vaguest idea of how to do the problem.

I have strong feelings on the question of open-book versus closed-book tests. What I want to know is whether my students can take the material I have given them—course notes, worked out problems, and a course text—and use it to solve problems; I really do not care how much data they can cram into their short-term memories the night before the quiz. An open book test allows me to find out what I want to know; it tests the students' understanding, not their memory, and it also provides a closer simulation of the tests that await them in their careers. As a fringe benefit, open-book tests eliminate the usefulness of inscribing or scotch-taping facts, formulas, and conversion factors on shirtsleeves and under socks.

There is no question but that a poorly constructed test invites cheating. I know a professor who seems to delight in making up test questions that even his faculty colleagues cannot decipher. In some cases the problems are trivial; the only trick is to figure out what is being asked. Students faced with this sort of thing tend to panic, envisioning zeros on the quiz since they do not even know how to get started, and they often take whatever measures they can to get out of their dilemma.

Another feature of some tests that drives students up the wall is the mistake-ridden problem that either has absurd solutions or cannot be solved at all. Such problems almost invariably appear when the instructor makes up the quiz at the last minute and does not bother to work out the solutions himself. If this is a chronic occurrence in a course, students tend to be much more inclined to share solutions than they might otherwise be.

Finally, we have the instructor who likes to make up tests for which the average is in the 20's or 30's. Rightly or wrongly, students regard such tests as basically unfair, and they often feel little remorse about cheating on them. I believe that tests like this are little more than ego trips for the professor—they do not serve any useful pedagogical purpose.

The closest I have ever come to cheating on a test was on my graduate school thermodynamics final. The whole course was a disaster—the text spoke about one body of material, the lectures about completely unrelated material, there were no quizzes—and the final examination had no apparent relation to either the book or the lectures. Fortunately, I was not led into temptation because there was no one to copy from—we were all in the same boat. I got a 9 on the exam (out of a possible 100). It was good enough for a B in the course; two hot-shots who got 12 and 11 got A's. However, I truly believe that if I had cheated on this travesty, God would have forgiven me.

11. What about students who miss tests?

On almost every test some students will not show up and will later appear in your office with stories that will astound you with their inventiveness, pathos, and sheer chutzpah. "My alarm didn't go off," is probably the most popular story, followed by, "My car wouldn't start," and complaints of every malady known to medical science and some that medical science has yet to catch up with.

All instructors hate make-up tests. It's hard enough to construct a fair test that covers everything you want to cover, that discriminates between students who are excellent, good, fair, and poor, and that can be finished within the allotted time slot. Having to do it twice is one of the great pains of higher education. To avoid it, some instructors allow no excuses except certified doctors' notes, and in the absence of such documentation a test grade of zero is assigned. (This approach is particularly appropriate if the instructor makes a practice of dropping the lowest test grade.) Others give students the benefit of the doubt and routinely give make-up tests, often taking them from previous years.

I tend to fall into the latter category, but I have my limits. Two students who missed a quiz last year came into my office and indicated that they had to go back home to stay by their dying grandmother's bedside. Since I had already given

one of these students a make-up test earlier in the semester (it seems his alarm clock had failed to go off, and then his car wouldn't start), I was a trifle skeptical, so after they left my office I called his home and inquired. There was no dying grandmother. The two students got zeros on the quiz, and they can expect to be watched with hawk's eyes for the remainder of their academic careers.

12 What should I do when I suspect a student of cheating?

It depends strongly on the grounds for your suspicion. Unless you have fairly clear evidence, the best procedure is to do nothing. It is better to miss an occasional violation than to subject an honest student to implications of dishonesty and possibly to public embarrassment.

If a student's paper shows evidence of foul play —it duplicates another paper too closely, for example, or it indicates ability completely inconsistent with previous performance, or it seems to have been tampered with after being graded and returned—calling the student into your office and asking him to discuss it with you is a first step. You might say you are not clear about how he arrived at his answers, and ask him to go over what he did. Or you can point out the things that make you suspicious and ask for explanations.

If the student denies all wrongdoing (as he usually will) and you have no way of proving conclusively that he cheated, give him the benefit of the doubt and drop the matter. If in fact he cheated, the fact that he was called in may be enough to keep him honest thereafter.

13. What should I do when I have clear proof that a student cheated?

All universities have administrative policies and procedures for dealing with this situation. Briefly, the N.C. State academic misconduct procedure involves confronting the student with the charges against him; filing a report on the case with the Department of Student Development if the student admits guilt; or referring the case to the Student Attorney General for a formal hearing if no admission is forthcoming.

Unless the instructor filing charges recommends a stronger sanction, a student who admits guilt or is found guilty by the hearing panel is given a zero on the assignment or test he cheated on and is placed on academic misconduct probation for the remainder of his career at the university. A record of the incident is placed in his permanent file, but does not appear on his transcript. A second violation results in suspension.

In most cases, instructors choose to avoid this procedure, either to keep students from getting black marks on their records or to avoid time-consuming red tape. They may take individual action ranging from assigning a grade of zero on a particular test to failing the student in the course, and in some instances recommending or demanding that he drop out of the curriculum.

Quite obviously, individual discipline is risky: a student may claim that his rights have been violated, and the instructor may find himself involved in much more red tape than he ever would have had to deal with by proceeding through official channels. The safest procedure is to adhere to the university policy—and it is mandatory to do so when penalties more severe than low test grades are involved.

The first step of the academic misconduct procedure is confronting the student with the charges against him, and requesting an admission of guilt. Before doing this, however, you should reread the university policy and inform the student of the consequences of admitting guilt and of denying it. Make a written transcript of the proceedings and have the student sign it attesting to its accuracy. A copy of the transcript can serve as the report to the Department of Student Development. Finally, make sure that you retain copies of any incriminating evidence, so that if a formal hearing is necessary you will be able to substantiate the charges that led to the procedure being initiated.

Finally, if a student in one of your courses has been proven guilty of cheating, I believe you should make your departmental colleagues aware of it. I once caught a student who tampered with a graded test and failed him on the test. Attempting to be fair to him, I said nothing about the incident to anyone. He managed to pass the course, made his way through the rest of the curriculum, and graduated. Subsequent to his graduation, it came out that almost every instructor who had him in their courses experienced difficulties of a similar nature, and all of them did what I did. He literally cheated his way through college and is now certified to practice chemical engineering, which is a frightening thought to me.

If my colleagues and I had just talked to each other, we would have been on the lookout for this type of behavior from him, and when it occurred, we would have known enough to proceed through

the university judicial system. He would have been placed on misconduct probation, and there is a good chance that his academic career would have been appropriately terminated. As it is, we can only hope that he is not now in a position to do too much damage.

CONCLUSION

These are distasteful things to have to write. I like and admire most students—if I didn't, I would find another profession. I detest the thought that I have to undertake the precautions outlined in this paper, which in a sense tar all students with the same brush.

I started my teaching career filled with an idealistic humanitarianism which held that if you assume the best in people they will reward you by living up to your expectations. Unfortunately, I quickly found out that it does not always work that way. My idealism was interpreted by the dishonest students as a license to cheat with impunity and by the honest ones as a sign that I didn't care about the cheating that they all knew was going on. I eventually concluded that taking precautions against cheating, regardless of the implications of these precautions, and dealing firmly with proven cheaters, were the fairest things I could do for my students.

Most students are basically honest. Most cheating incidents do not reflect chronic behavior patterns, but slips resulting from momentary panic. As an instructor, you should keep this in mind: always give students the benefit of the doubt when a reasonable doubt exists, and do all you can to avoid blackening their records and jeopardizing their futures by overreacting to minor ethical slips. At the same time, make it quite clear to your students that cheating is unacceptable, and back your words up when it becomes necessary to do so. By so doing, you will be serving the interests of the students, yourself, your faculty colleagues, and the university as a whole. □

ChE book reviews

THE PRACTICAL USE OF THEORY IN FLUID FLOW. Book I: Inertial Flows

By S. W. Churchill; Etaner Press, Thornton, PA 19373 (1980)

Reviewed by
David G. Thomas
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The selection of words and their order in the title of this text describe the emphasis and objectives of the author. To accomplish this, simple derivations from first principles are used to explain practical problems that occur in single phase compressible and incompressible flows. The basic physics of the flow phenomena is retained even when developing approximate models which often are of sufficient accuracy for engineering applications. More to the point, because empirical models are avoided whenever possible, increased confidence in the generality of the result is developed.

This is an unusual book in several respects. It is not listed in the 1983-84 edition of Books in Print. Under the umbrella of the general title are included 7 books, of which the one under review is the first. Other titles in the series are:

- **II One-dimensional Laminar Flows**
- **III The General Equations of Motion**
- **IV Unconfined Multidimensional Flows**
- **V Confined Multidimensional Laminar Flows**
- **VI Confined Turbulent Flows**
- **VII Flows Through Dispersed Media**

The division of subject matter indicated above results in an unusual grouping of topics on both compressible and incompressible flow in Book I. For instance, successive chapter titles are: Ch. 1, Reversible Expansions and Compressions; Ch. 2, Expansions at Low Velocity; Ch. 3, Maximum Reversible Rates of Flow for a Gas; Ch. 4, Jet Propulsion Engines; Ch. 5, Maximum Rate of Flow of Gas Through a Pipe; Ch. 6, Sudden Expansions and Contractions; Ch. 7, Shock Waves; Ch. 8, Detonation Waves in Gases; Ch. 9, Surface Waves, and Ch. 10, Cavitation, Incipient Vaporization and Aerodynamic Heating. There are an average of 20 problems for each chapter and it would be essential to solve the majority of them to gain full benefit from the approach selected by the author. Not only do the problems require an understanding of the basic principles but some developments of importance are deferred to the problem sets. Numerical methods are avoided. This book is suitable for a senior or first year graduate course. □