Design Your Course to Minimize Cheating

For all the students who find this on the internet and hope that I will tell them how to cheat in a class or exam – sorry. Instead, this article is targeted at instructors who want to design their course to minimize both the opportunity and the incentive to cheat. James Lang's *Cheating Lessons: Learning from Academic Dishonesty*[1] examines cases of cheating and uses these to explain why students cheat (Chapter 2). Four chapters then examine "The (Nearly) Cheating Free Classroom" with examples how individual instructors have modified their teaching, learning experiences, student activities, homework, and grading to minimize the motivation and opportunity to cheat. Some simple changes can minimize cheating opportunities and may also result in improved teaching. How can these lessons be applied by ChE instructors? Lang[1] has additional discussions on each topic at the page numbers, identified parenthetically below. In what follows, I discuss some of these approaches.

To foster intrinsic motivation, center the course on questions or issues many students already care deeply about (p.63)[1] and have students engage with real people, problems, and situations to create unique learning experiences that render it difficult to cheat.(p.61) For example, have the students analyze renewable energy, production of a new medicine, or a medical device from the literature or ask a practicing engineer probing questions. This approach is a good match for first-year seminars, service learning courses, and ChE design projects. Use assessments that are unique to each specific course you teach such as writing journal entries in a learning portfolio (p.61), or mimicking consulting companies and requiring students to log and describe their chargeable hours in senior design. Have students evaluate the accuracy of reporting on topics in the press by examining a recent account from the popular media. If a local newspaper story is used, it may be possible to invite the reporter to class for an interview either live or by Skype. The students thus apply their knowledge from the course to a topic that changes each semester, and they practice communicating with non-engineers.

In elective courses, change the rigid assessments to a game-like system in which students earn points for completing assignments.(p.90) Allow students to pick their options to increase their motivation. Give plenty of opportunities for points, but ensure that students have to engage with critical components of the course.(p.92) Instead of a paper, allow projects, presentations, websites, or videos as the deliverable as long as the desired outcomes can be demonstrated. (A potential downside of this approach is that student designed projects may be too broad.)

In required core courses, which typically rely on textbook-based homework problems, minimize performance anxiety and transfer issues (taking knowledge from one context and applying in another context) by providing frequent opportunities for students to practice retrieval and rehearsal of information.(p.119) These ideas are built into flipped courses and work well in typical ChE problem solving courses. Include: 1) frequent, lower-stakes quizzes and tests to motivate students to learn the material; 2) weekly on-line multiple choice quizzes (to encourage students to keep up with the reading material) – have students take the quiz twice and keep the high score; and 3) on-line quizzes where students don't get the answers immediately (and thus have difficulty gaming the system), but quizzes are reviewed in class.

Find ways to instill self-efficacy[2] to provide students the confidence they need to undertake challenges while also ensuring they don't underestimate the effort required.(p.129) Students who work on problems in class gain an immediate understanding of the difficulty and time required for completion.(p.145) In a ChE problem solving course, have students do "concept synthesis" in class by outlining the probable steps to solve a homework problem. These approaches can be done individually or in teams. Emphasize that the next quiz or exam will require the use of these steps. Start a problem or derivation in class; have the students finish on their own in a homework set. This allows the instructor to see how the work was revised, completed, and improved. (p.148)

While these approaches won't eliminate cheating, they minimize the incentive and opportunity to do so, while also allowing course improvements.

REFERENCES

1. Lang JM (2013) *Cheating Lessons: Learning from Academic Dishonesty*. Harvard University Press, Cambridge, MA.
2. Brennan J and Solomon ED (2019) Effect of unit operations laboratory course structure on learning and self-efficacy. *Chem. Eng. Ed.* 53(3): 147-156. ❐

—JOSEPH H. HOLLES, UNIVERSITY OF WYOMING, LARAMIE, WY 82071