

A Perspective on Instructor Sanity (or lack thereof) and Student Engagement (or lack thereof) in Large Lecture Courses

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Abstract

Large lecture courses present unique challenges to instructors, especially to instructors teaching multiple courses in the same semester. Some of these challenges include “simple” (yet overwhelming) administrative logistics, such as giving, grading and recording results of potentially thousands of exams and assignments in a single semester. Other challenges center around enhancing student engagement and performance. As many large lecture classes are lower division introductory courses, these challenges can be amplified when instructors are confronted by the range of preparedness of beginning students, as well as the stringency required by introductory courses that are preparatory to upper division courses in many departments.

During the past seven semesters, I have tried a number of strategies to deal with some of these issues. I will discuss my experiences with online course management tools (such as WebCT) to facilitate e-mail correspondence with students, as well as to replace traditional homework assignments with automatically graded quizzes. I will also discuss recent experiences with wireless instant response technology (“clickers”) in my large, introductory biology classes. The clickers provide an opportunity for students to use an infrared “remote control” device to respond to in-class questions, with the results being instantly available to the entire class (and the instructor). Thus, potential opportunities for student engagement and learning are provided with this technology.

Introduction

Large, introductory courses (especially in the sciences) present a spectrum of challenges to both instructors and students. The large class size can be intimidating to students, and cause a huge administrative burden on faculty. The courses are meant to be preparatory to upper division courses, and thus must cover a breadth of material with more than superficial depth. The depth can be particularly challenging to students who may be entering college without sufficient preparation to successfully handle the material being presented in their introductory courses. For example, the American Society of Cell Biology recently analyzed ACT scores of high school seniors and concluded that only 26% of these students are expected to earn a C or better in their introductory college biology classes {1}. The result can be a sense of frustration (by both faculty and students), which can impede a constructive learning experience.

As an instructor of large, introductory biology courses (for both majors and non-majors), I have experienced many of these potentially frustrating experiences first-hand. By way of example, in the present semester, I have approximately 540 students in three different introductory courses (with smallest course having 115 students), and no TA support. However, I have been trying a

number of approaches to manage this load, and still have energy and enthusiasm for the task at hand- namely preparing students for their future courses and instilling in them a sense of amazement about biology. I hope to be able to share some of these ideas, as well as discuss my sense of their success (or not). Please keep in mind that these impressions are not the result of extensive research, but are merely observations about my experiences with various technologies.

As noted above, the vast majority of high school seniors in the US are not expected to pass (with a C or better) their introductory biology courses {1}. This presents a particular challenge to instructors of introductory biology courses, one that I have experienced first hand. For example, I have taught sections of introductory biology with passing rates (grades of C or better) of only approximately 40%. While this may be “ahead of the curve” based on predictions relying on ACT results (*i.e.* predictions of 26% passing with a C or better), it is hardly encouraging. Based on this preliminary experience, I have tried a number of “interventions”, which I will discuss below.

Open-Ended Homework Assignments

While I always prepare “review questions” following each lecture topic, and post them to a web site, these didn’t seem to be having an appreciable impact on overall class performance.

Comments from students suggested that students who worked these review questions derived great benefit from them, but that many students did not take advantage of them. I thus decided to assign homework assignments, due approximately one week before each exam in the class. The homeworks consisted of open-ended questions (while the exams are multiple choice), and represented a monumental grading effort. However, the results were encouraging. Performance on individual exams (as determined by individual exam means) improved, as did the overall percentage of students earning a grade of C or better in the course (from 40% to 55%). However, they proved to be challenging to grade. Even in semesters when I had the assistance of a graduate student, there were always some answers that required my review, and the graduate assistant ended up spending a huge amount of time grading them. Thus, based on the grading effort, as well as my overall teaching load, I was compelled to try a different approach to homework assignments.

Post-Exam Homework Assignments

As noted above, the pre-exam homeworks seemed to have a positive impact on performance, presumably because they provided an incentive to study well in advance of each exam (as well as to then be made aware of areas of confusion prior to each exam). However, I needed a way to streamline the grading process. While studying well in advance of each exam is certainly a strategy for success, there is merit in adjusting one’s approach to studying, based on results of exams. Thus, I assigned homeworks in which each student “analyzed” two questions that they had missed (or struggled with) on each exam. My hope was that students would both go back and master foundational material after each exam (rather than ignoring material that they didn’t understand and then trying to make progress in the course based on a shaky foundation) and change (if necessary) their approach to future exams, based on mistakes made on prior exams.

The grading of these assignments was certainly more streamlined, as students simply re-typed two multiple choice questions, and then commented on each possible answer. In the semester that I used this approach, the overall success rate (based on students passing with a C or better)

was nearly identical to the semester in which I assigned pre-exam, open-ended homeworks (56% compared to 55%) . Review of student evaluations suggested that while some students clearly appreciated this approach, and stated that they did improve based on learning from their mistakes, a majority of the students explicitly stated that they felt they would have done better with homework assignments preceding (rather than following) each exam. Many students stated that while the points earned on post-exam homeworks helped their overall grade in the class, the assignments didn't really contribute to their learning. Fundamentally, I have to agree.

WebCT Quizzes

Based on the above homework experiences, I am committed to providing opportunities for students to “practice” (in a point-earning, and thus somewhat significant manner) the material prior to each exam. Confronted with increasing student numbers, and vanishing grading assistance, I decided to try WebCT (an on-line course management tool). In my particular situation, WebCT has provided a number of distinct advantages. One of the major ones is that WebCT allows me to partition my course e-mails, and to be able to immediately identify an e-mail as being related to a specific course (rather than my “MWF biology class”- which doesn't narrow it down when I teach three large courses, each offered on a MWF schedule). While I have always tried to be available by e-mail to my students, I have found that WebCT makes it much easier to keep track of course-specific e-mails.

WebCT also offers a quiz tool, with which I can write quizzes that students can take outside of class time, and are then automatically graded and the grades are automatically added to the grade book. This semester I have six quizzes in each class. They are timed to either precede each in-class exam, and/or to reinforce traditionally challenging material, thereby providing the opportunity to practice before each exam. However, the format is primarily multiple choice, and I wished to provide learning opportunities in another format.

eInstruction Wireless Instant Response System (Classroom Performance System)

I have been lucky enough to participate in the New Mexico Space Grant GRASP Program, in which active learning strategies were emphasized. The eInstruction system takes this idea to a different level. With this system, students have registered “clickers” which they bring to class. During class, I can present a question (usually multiple choice) that reviews or applies the material we have been discussing. Students use their clickers to “vote” for an answer. I can then immediately display a bar graph of the frequency with which each answer was selected. This presents some distinct opportunities.

From my perspective, I can see whether or not students are understanding what we have just been discussing. I have found that is much more reliable than looking around the room for a few students to nod (and really having no idea of whether the vast majority of the students are also confident about their grasp of the material). When there is a disparity of opinion (for example, the answers are “all over the map”), I can go back to the question, and work through the material again, to clarify. On one occasion there was a fair amount of consensus on an incorrect answer, and I was able to ascertain the source of confusion and get it cleared up on the spot (rather than finding out about a point of unexpected confusion on the exam). I also save a copy of the votes (in the form of a report), and I can use this to assign participation points in the class. In this first

semester, I am only assigning points based on participation (*i.e.* being present and clicking), and not on accuracy.

From the student perspective, the anecdotal comments that I have received thus far have been generally positive. In my smaller class (115 students), the comments have been uniformly positive. Several students have said that they would not put their hand up (to either volunteer an answer or to indicate their answer by a show of hands), but that they have no hesitation to vote with the clicker (as it is anonymous from the student's perspective). Other students have indicated that they "pay more attention" in class, as they know a question will be coming up, and others have indicated that they would not otherwise force themselves to answer a question in class. In my larger class, the initial response was not as uniformly positive. I think that part of this was due to issues of getting the receivers positioned such that all clicks (votes) are easily registered by the receivers in the larger room. Now that this has been resolved, students have also expressed positive opinions about using the clicker in class.

I am planning to invite students to participate in an anonymous WebCT survey, in which I will ask questions about their opinions about in-class clicker questions. Some of the things I will be interested in hearing about include

- Do they like having questions interspersed throughout the lecture (which is reported to enhance retention), or would they prefer to have the questions clustered at the start of lecture (review of previous day's material) or at the end of lecture?
- Do they like having participation points associated with the clicker?
- Would they have purchased and registered the clicker if there were no points associated with its use?
- Would they prefer no points, participation points or "accuracy" points associated with clicker use?
- Did they feel that they learned more with the clicker use than they would have without it?

At the present time, I am very encouraged by the use of this system in my classes. There are a few things that have proven to be challenging, both for me and for my students, but at the present time, my feeling is that none of these are insurmountable. I will continue to use the clickers next semester, and will use feedback that I hope to receive on student evaluations and surveys to maximize the potential benefits of this new technology.

While I have focused on technology, I also would like to point out that my teaching style works best when I can connect with my students. As highlighted in an article in the Chronicle for Higher Education {2}, instructors teaching large lecture classes often manage to engage their students, even in auditorium settings. While I hope the clickers add to engagement, I also want students to be more than their "clicker number" in class. I always encourage questions, and always answer them. I would rather use time to interact with curious students in class than rigidly staying committed to a lecture schedule. For example, I had one slide on stem cells in a class today, which stimulated a 5-10 minute discussion. I feel that time was very well spent. I hope that through my willingness to answer questions in class, students will realize that I am available and do care. In order to reinforce this, I have also borrowed an out-of-office office hours strategy I learned while at the University of Pittsburgh.

Coffee Hours

I have adopted a strategy I participated in at the University of Pittsburgh- namely to have one set of office hours each week out of my office. Here at NMSU, I have found the greatest success by holding one set of office hours each week in the seating area near the coffee bar (hence the “coffee hours” designation) in the Student Union (Corbett Center). Not only does it give me an opportunity to get out of my basement office, but I believe it makes me more accessible to students. Furthermore, former students who are passing by often stop to say hello and catch up, and it often ends up being a highlight of my week. While my regular office hours are often well attended, I probably have as many students at my coffee hours each week (in 90 minutes) as I do in the remainder of my office hours combined (4.5 hours).

Conclusion

Teaching large lecture courses can be overwhelming as well as very rewarding. I try to maintain the balance of judicious use of time-saving technology, as well as whole-hearted student interactions, so that I can reserve most of my (at times abundant) energy to deliver effective and organized lectures, and stimulate an appreciation for biology in my students.

References & Resources

1. U.S. High School Seniors Not Ready for College Biology (2003). The ASCB Newsletter, Vol 26, No. 9: 11-12. Accessed at http://www.ascb.org/news/vol29no9/ie/September-03_11.html
2. Bartlett, T. (2003). Big, but Not Bad. The Best teaching doesn't always happen around a seminar table. The Chronicle for Higher Education, May 9, 2003, A12.

eInstruction: www.einstruction.com

Information on WebCT (including training schedules for faculty): <http://salsa.nmsu.edu>