Teaching Large Classes

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Introduction: First Things First

This module is designed to highlight issues that arise when teaching a large class, and to offer some advice for enhancing learning and student enjoyment in that context. The content of this document is informal. I do not want to presume to tell anyone what to do, so I have written this module in the first person, and explain what it is that I do in my large class. While some of the methods I suggest have been empirically tested in my own laboratory and/or validated in published literature, some are recommended simply because I've found they work for me. In other words, this document is largely an account of what I've learned since I began teaching large classes about ten years ago.

In some sections I offer concrete suggestions and procedures. Because each discipline and each person's teaching style differs, however, some sections of this document offer ideas meant to serve as examples that I hope will get the reader thinking about his or her own course. There are a number of factors that might be helpful to think about before making concrete decisions about course structure and pedagogy, so I begin this module by identifying a few that I think are important.

What is large?

50? 100? 200? The answer to this question will determine **what is feasible** in a classroom. Depending upon the physical classroom, for example, it may be possible to break a class of 50 into 5 groups of 10 to have discussions, while an auditorium with 200 doesn't make such an activity feasible. Likewise, it may be possible to monitor online discussions or assign several short papers in a group of 50, while a larger class might make one think twice about such an undertaking. It may not be too overwhelming to grade a series of short-answer exam questions for a class of 50, but as class size grows, the appeal of multiple choice exams vastly increases. Most of my experience is with classes of 150-210, so the content of this module is targeted mostly at classes of 100 or more. If yours is smaller, you may be able to expand or adapt the techniques presented here to take advantage of a somewhat smaller group.

How much assistance do I have?

If you have a **good teaching assistant** for a sufficient number of hours that can help with grading, you might feel comfortable including short answer questions on exams, or assigning one or more short papers during the semester, even if you have a class of 100 or more. Likewise, you might have the assistant run discussion groups once a week or even once

or twice a semester with smaller groups. Discussions can also be had online and an assistant could be charged with monitoring that portion of the course. Of course, class size is also relevant to this question, as a conversation between 200 students isn't really feasible unless it's broken up into smaller groups. Most faculty on our campus don't have sufficient TA help to accommodate multiple online discussion groups, so class size is still a mediator of what is possible in a classroom even when TA help is available.

Are my learning goals appropriate for my class size?

If the class is too large to routinely accommodate activities other than lectures, it may be inappropriate to expect more of one's students than factual learning and perhaps a bit of problem-solving. Unless there is a mechanism for offering practice at critical thinking, applying data to theory, or other such "deep learning" events, the goals of a course may need to be shaped, in part, by **what is feasible in large groups**. I find it helpful to think about what my ideal goals for a class are, decide what I can reasonably accomplish in the class, and then revise my list of objectives.

Attention and attendance: How far do my responsibilities extend?

It is a matter of one's **professional philosophy** to determine the extent to which the faculty member is responsible for maintaining students' attention and attendance. Some professors believe it is their responsibility and create strict policies designed to force students into compliance. For example, some ban laptops for note taking in order to prevent students from going online during class, fail students that have missed some predetermined number of classes, and so forth. Others take a more hands-off approach in the belief that a professor's responsibility is to provide the structure, pedagogy and opportunity for students to succeed, and that it is the student's job to ensure he or she attends class, pays attention and completes assignments. Each professor must decide the right balance between these perspectives in his or her classroom.
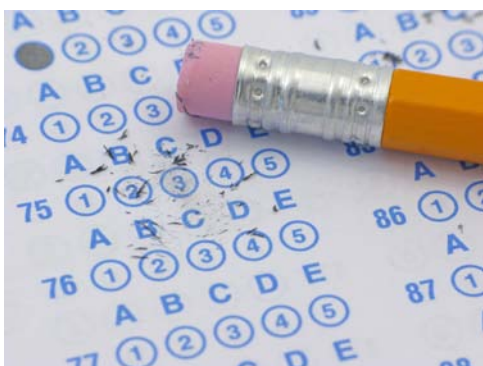
I have swayed back and forth on this issue since my first day teaching. I don't personally find fault with either of the extreme positions, as each has its merit. Regardless of the stance one takes, it is important to be clear in one's mind and on the syllabus about what is expected of students and whether there are penalties for not complying. My current

position (which may change tomorrow) in my class of 210 is that trying to force attention is a bit like plugging a dike with my finger. It's a losing battle and students have to make their own choices. I do have a strict policy on any behavior that distracts other students, however. As such, I do forbid students from talking, listening to music or other behaviors that may be distracting. If they choose to surf online rather than attend to class, that is not an issue I tackle in class, other than to remind them of its folly, from time to time.

Is it terrible to use only multiple-choice exams?

No. As class size increases, grading papers or even short answer questions becomes increasingly unrealistic, especially with little or no TA help. In addition, it is possible to write **multiple-choice questions that are very good measures of learning**. Academic Computing Services will provide upon request statistics for each exam question. The **difficulty index** provides a simple proportion of the class that got each question right. The harder the question, the lower the percentage. Generally speaking, a difficulty index of more that 75% indicates an easy item, and one that is below 25% is a hard one. This measure can also be used to judge poor distractor items. If a high proportion of students choose a particular distractor, it may indicate a problem with the question or that distractor. Alternatively, it may indicate a concept that needs to be disambiguated in future lectures. Generally speaking, it is good to have most test items within the 30-50% range of difficulty. Items that are too easy or too difficult reduce the discriminating power of a test.

The **discrimination index** (DI) offers a more fine-grained statistic for each question. Specifically, it identifies the number of students in the top 25% of the class that got the question right and subtracts from it the number of students in the bottom 25% that got it right. A statistically "good" question is one with a high DI, as it indicates that the stronger students are getting it right at a higher rate than the weaker students. The DI of a question that discriminates well between students that have mastered the targeted concept versus those that have not may range from .45-1.0. It takes some time to hone a collection of questions over the years but the results are well worth it, as exams become more accurate reflections of learning when these statistics are properly used.

Active learning and engagement strategies

Using clickers

Clickers can promote attendance and learning when questions are asked in class daily, the clicker questions are a graded component of the class, and the questions are asked throughout the class period. By using clickers in this way, students are provided some motivation for coming and paying attention. If they are texting or daydreaming and a question is asked about the content that was just covered, he or she is quickly dissuaded from that behavior. Moreover, a great deal of research has shown that the right kinds of questions actually help students retain the material they target.

Making the information personal

While it might sound like a jaded criticism of our students, the fact is that many young adults are fairly self-involved, seeing the world and information through a fairly egocentric lens. Though certainly not true of every young adult in every situation, this is a truth that has its basis in the neural development of most young adults. As such, many students are able to better understand and retain information when it is made personally relevant to them. For this reason, I try to encourage them to think of examples in their lives that might embody principles discussed in class.

I also use clickers to **engage them in activities that pull their personal perspectives or experience into the lecture content**. In one successful exercise, I introduce the topic of sleep and sleep deprivation by asking them how much sleep they need in a night (less than 6, 6-7, 8-9, or more than 9). After answering I am able to put up a bar graph showing that most answer 8-9, with a smattering of answers for the other options. I then show them a graph indicating the national average by age.

Because the clicker question results are shown in class, they are able to see that the class average matches the average for their age group on the graph. By considering their own experience they become

personally interested in the content of the graph, and hence the overarching concept it's meant to impart. Moreover, because there is typically a nice bell curve to the class results, the issue of individual differences, a strong theme running throughout the class, is also effectively demonstrated.

Showing rather than telling

Any time a concept can be demonstrated rather than told to a class the targeted concept becomes **more salient**. In a large class, the demonstration serves a second purpose of **"breaking up" the lecture** component of the course and gathering students' attention. For example,

to demonstrate several concepts about memory (i.e., the differences between recall and recognition memory, memory decay and memory retrieval failure) I ask them to name the 7 dwarves from the Snow White story then ask them to indicate with their clickers how many were able to think of all 7. Typically it's far less than half the class, and they are able to see the results on the bar graph I project. I then show them four lists and ask them to identify which contains the correct names. Most classes score about 95% correct, and that is also shown on a bar graph. The activity is amusing, but also makes the concepts I'll be discussing over the next few classes more meaningful. (In case you're wondering, it's Happy, Sleepy, Dopey, Sneezy, Grumpy, Bashful and Doc).
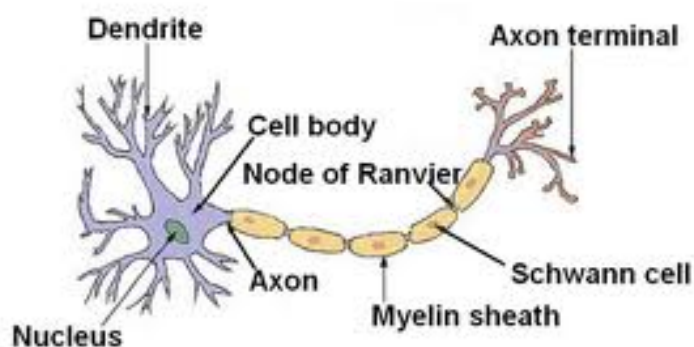
To demonstrate the importance of conformity in groups, I walk into class wearing a banana suit and start to teach as normal. Several minutes into it, I feign a puzzled look and ask them why they seem so distracted. By getting them to explain to me what is on their minds and what is distracting them they are able to articulate the main point I'm trying to impart about conformity without my telling them. That is, the **students are able to explain** the important role of conformity in promoting group harmony and freeing up mental effort to deal with other tasks.

Getting them physically engaged

Getting students physically moving not only gives them a **kinesthetic memory** through which they may later access memory for the underlying concept, but it also **breaks the monotony** of normal lecture mode and gets them attending to the material. For example, when talking about progressive relaxation, I have them do a short exercise in the process. That particular exercise I only do at the *end* of a class, however, as I find they're a bit too relaxed to attend to the material afterward!

In another exercise, I ask for volunteers to come to the front of the room to demonstrate how a neuron functions. Each volunteer is asked to wear a sign that identifies his or her role, either as dendrite, axon segment, or axon terminal. I hand a message to the dendrite, who passes it to the first axon segment. The axon segment tosses me a banana (representing potassium) and I toss back a shaker of salt (representing sodium). We then reverse the exchange, the segment passes the note to the next segment and we repeat the process. When it gets to the last axon segment, the note is handed to the axon terminal, who uses a water gun to squirt a "neurotransmitter" into the empty space to her left (the synapse). For the few in the demonstration, a physical experience of the material is added to their understanding of the process. For those watching, they benefit from a different representation than is available in the book or lecture. I do plan to film this demonstration next time and put it online. I am hoping students will view it multiple times to show their friends. My hope is that the live demonstration (and potentially its repetition) will allow them to remember the process of the action potential and synaptic transmission.

Online and blended learning solutions

The myCourses software is a great **resource for large classes**. With so many students, it can become daunting to replace lost syllabi, get announcements to students, and so forth. I put pretty much everything on my class site. Rather than answering many dozens of emails with tailored

responses to questions, I can simply refer students to those resources. The time savings are enormous. I also put PDF files of my class lecture slides online before we begin each new unit. I print two full-color slides on each page, which students can print and bring to class. With those in hand, students don't have to write down everything I say because much of it is already there for them. This allows the more meticulous students to focus more on what I'm saying, rather than trying to get down every word. For less skilled students, this practice makes sure they aren't missing main points.

Unfortunately, many of the practices that make online or blended learning work well are not feasible with very large classes. Specifically, class discussions, journaling and wikis are not easy to manage with 200 students. Even if a class is broken into smaller discussion groups, monitoring ten discussions among groups of 20 isn't feasible for the average professor. For this reason, I have shied away from those tools. I do, however, **post links to documents, web pages or videos** that I want students to read or view. If they do so at home, I can use that content to begin a discussion or refer to as an example when in class. It enriches the content without taking up additional time in class. I do suggest asking exam or clicker questions about online content to ensure that students are completing the at-home assignments.

Promoting and enforcing academic honesty

Clickers

It is possible for students to cheat on clicker points by giving their device to a friend. The friend can click in answers on their behalf and there is be no way to know. I have observed this on multiple occasions in my class. I do make it clear to my students (and have included in my syllabus) that anyone caught with two clickers in hand will have both devices confiscated. I write down the serial numbers of both and both students lose all their points for the semester.
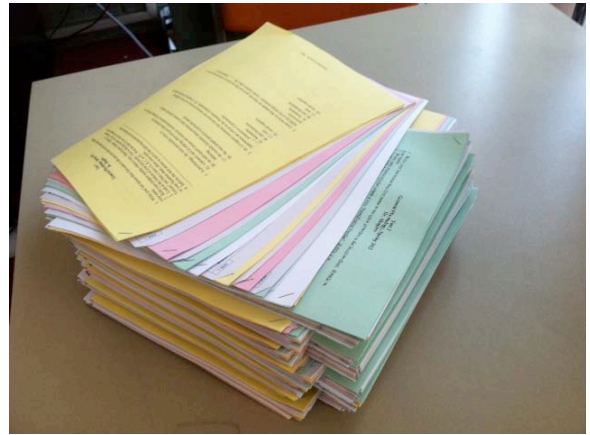
Exams

With a large number of students in a class, they are seated very close to one another and it is very easy for students to see a neighbor's answer sheet. I prevent this problem by printing **four versions** of each exam. The questions are identical but the order of the questions or response choices (or both) can be scrambled. I then use the following procedure:

- *Colored paper.* Each version of the test is printed on a different color paper. (Pastels work best, as they are easier for students to read.)

- *Collate into alternating stacks.* I collate the exams into stacks of alternating versions. The number of stacks is equivalent to the number of rows in the room in which I teach. In CVPA153, there are 15 rows of 13 seats so I create 15 stacks of 13 exams. I also put a Scantron answer sheet with each test.

- *Handing out exams.* Done this way, handing out the exams only requires walking up the aisle and handing a stack to each student on the end. Students are asked to take the top test and pass the pile down. I tell them that if they end up with a test that is the same color as the person next to them, I will know by color that they have switched the tests and both students will be given a 0 on the test.

- *Latecomers.* Anyone coming late to the test is asked to take a seat. Once seated, I am able to see what version the people around them have by glancing at the paper colors and give them a different version.

- *Circle like a buzzard.* The sad truth is that cheating is rampant so it is very important to proctor the exam carefully. A minimum of two people is required. During the exam, my TA and I walk "laps" around the room. The reason for this is partly to be there in case students have questions. It also allows me to look for students reading notes or talking. Once students are done, they will begin to come up to the room to hand in their tests. It is important to have one person continue circling in the room while the other is at the front to collect the exams. I have found a lot of cheating happens if students believe no one is watching.

- *Check version codes*. When students put their names on their Scantron sheets, they are also asked to put the version identifier printed on each exam (A, B, C or D) in the margin above their names. When they hand in their tests, it is important to make sure the test version identifier they put on the Scantron matches the test version they hand in. Some students have tried to cheat by copying an entire test from a neighbor then writing the neighbor's version number on their own Scantron. When the tests are handed in, the person collecting them should sort them into piles by version. A separate answer key and order form for ASC should be filled out as though they are four different exams.

Classroom culture and behavior

It's extremely important to foster a **positive group culture** in a large class. As discussed previously (on page 3), an instructor must decide what rules to set regarding online access, texting, MP3 players, and so forth. Whatever one's choices are, I have found that it's vital to enforce them evenly and consistently. In my own class, my particular peeve is students conversing during class. When it happens, I stop the class and refuse to continue until they stop. After a first incidence, I either point them out and scold them publically (which students find embarrassing) or ask them to leave. I find that once a student is ejected from class the rest of the semester runs very smoothly.

When taking a strong position on a behavioral issue, I find it prevents an adversarial relationship from developing if I explain to students *why* the policy is in place. With respect to talking, I explain that I find it distracting while I'm trying to deliver content. The other, and more pressing issue, is that I have a need to advocate for the students around them who are trying to learn. I explain that if a conversation is important they are welcome to leave the class but that they may not stay in the class and talk because they are robbing those around them of what they come to class for. In offering such an explanation, the students understand that my policies are not there because I'm old and cranky (I may well be, but that's not the reason for the policy, mind you), but because I care about my students. Most appreciate the effort and the policy.

Exam and grading policies that (might) keep you sane

With so many students, I find it works best to **be explicit about very clear policies**. There is no way to anticipate every situation that might arise during a semester, but after several years of teaching large classes I have run into all of the common ones and have altered my written course policy to address them. Even things one might think are understood and do not require mention in a policy statement can become points of argument, causing heartache and becoming a time sink if not made explicit in the written policy (e.g., students coming in late don't get extra time for the test, no electronic devices or notes are allowed, etc.). Anything that is clear in the written policy statement will prevent potential student concerns about fairness or ambiguity.

There are several specific policy items I do strongly recommend. One is a **"no make-ups" policy** for missed tests. If only 5% of the class misses a test in a class of 200, that means 10 make-up tests must be scheduled with individual students. I found it to be too complicated and time-consuming. Moreover, I found that once students knew they were able to take a make-up, a flood of requests were made for each test. The make-up issue was simply overwhelming the first semester I taught my large class. Instead of offering make-ups, I now drop the lowest test grade from the final grade calculation. If a student is ill or has an emergency, this gives the student an "out" without penalty. I do allow a make-up if two tests are missed and both are documented by a doctor, court, etc. Once I implemented the policy, it was striking how few missed exams there were during the semester. There are other policies that may work for another professor that may be less black and white than this. It will depend on class size, TA help, and ones tolerance for accommodating individual students' schedules throughout the semester.

I also do not offer **extra credit**. I receive numerous requests for extra credit at the end of each semester by students. The problem is that once a student is granted the opportunity, it becomes an ethical issue to not offer it to the other 199. This leads one into a trap of grading dozens if not hundreds of papers or projects at the end of the semester. Again, this is not feasible. I take pains to ensure my exams and grading are fair and to offer students every opportunity to succeed (all of which I'd be glad to share). On a side, note, the expectation for extra credit has gotten out of hand, in my opinion. Ultimately, a final grade must reflect mastery of the core

material. If the assignments and grading are valid and fair, extra credit should not be required to reflect a student's mastery.

Finally, I **don't bring pencils** to exams. I tell students they will need one and remind them before the first test. I found that if I brought pencils a huge portion of the class came without one to subsequent exams. Once I stopped, it was the rare student that came empty handed.

A little humor goes a long way

Many of the activities and examples I have documented here are light- hearted or amusing in some way, and this is by design. When students are able to laugh a little in class, they are more motivated to come. Also, a bit of humor breaks up the monotony of a professor droning on for 50 minutes. Finally, some levity creates good rapport with students and may make them more willing to come to office hours for help if they need it.