Advice from Instructors

Overview

In response to our call for materials to use in framing active learning classes, several instructors shared a description of their general approach rather than particular materials. We felt that these comments in their raw form represent some well-articulated pedagogical philosophies, and so we share them here so that other instructors can benefit from their insights.

Ian Beatty, *UNC Greensboro-Physics*

See Ian's clicker questions and meta-communication strategies in the "clicker" files.

I try not to frame my course as "stuff that will help you on the exam" or otherwise cast the whole game as about exams and grades. Call me an idealist, but I stubbornly stick to the perspective (vocally, in my courses) that the point is to learn stuff that's both fascinating and long-term useful to their personal and career aspirations, and that exams and grades are annoying necessities that we should avoid getting too hung up about. (In my junior-level thermo course this fall, I actually refused to give any points, grades, or other codified evaluative feedback until the final course grade at the very end. All feedback on homework and exams was individualized commentary on strengths, weaknesses, and things to work on.)

That being said, I make a distinction between "explaining" clicker use (and other active-learning strategies I use, such as group whiteboarding and group exams) and "selling" it to the students. If students feel like I'm trying to sell the idea to them, they get suspicious, because I've stupidly communicated the idea that (a) clickers are something controversial that needs to be sold, and (b) they have some kind of valid opinion on the matter. I prefer to take the position that "this is just the way I teach, because overwhelming evidence and experience show that it's what works well, but I also want you to understand what I'm doing and why so that you can play your role with as much awareness as possible. The more we're on the same page, the better this whole thing works." See the difference? It's all about framing.

I meta-commumicate a lot with my students, both at the beginning of the course and throughout. I occasionally interject bits about how the brain works, tidbits from learning research, etc. I habitually explain why I'm doing the things I'm doing in my teaching, and what I want them to be focused on. I also promise them that they're always free to ask me the justification for any element or aspect of the course.

I include clicker questions designed to support meta-communication, and also to (subtly or obviously) communicate a certain framing of clicker use. Features include obviously having multiple defensible choices (so it's about reasons rather than answers picked), latent ambiguities that students can discover, leading to discussions about the role of assumptions in learning and doing physics, etc.

I think not giving any form of points or credit for clicker questions, and keeping no track of which students even have which clickers, helps. I can, with great credibility, claim that clickers are merely one more tool to help us communicate, discuss, and

Author

Beth Simon, UCSD
Ian Beatty, UNC Greensboro
Brian Katz, Augustana College
Doug Duncan, CU Boulder
DJ Wagner, Grove City College
Mark Maier, Glendale C.C.
Paul Camp, Spelman College
John Hubisz, North Carolina State U.

About this Project

This is one of a set of materials compiled for instructors to draw upon in order to frame non-traditional modes of classroom teaching for their students. Our hope is that these materials can help reduce any student resistance to such techniques.

Compiled by Stephanie Chasteen (University of Colorado Boulder Science Education Initiative): Stephanie.Chasteen@Colorado.EDU.

Other materials available online at www.colorado.edu/sei/fac-resources

generally make sense of this stuff.

Frankly, if a student isn't into this whole engaged-active-learning thing, they're going to have bigger problems with my class than just the clickers. They usually complain that I don't lecture much and "don't teach them anything", forcing them to learn everything by themselves outside of class.

Do all the students buy the approach? Definitely not. But typically, enough do to set a positive class climate, and the recalcitrant ones grudgingly go along. Even those usually change their tune by the end of the second semester in the sequence.

It also helps that I work like a flaming dog to teach as well as I can, and the student see me bleed for them (extra grading from "letting" them redo exams as take-home open-book collaborative tests, etc.). They may disagree with my methods, but very few doubt my sincere intentions. That goes a long way.

One of the meta-communication bits I repeat again and again is that "you need to talk to learn". I stress the importance of putting your own thoughts into words in order to figure out what you actually think and to improve your thoughts, and of confronting other people's thinking. For me, clickers (and group whiteboarding) are first and foremost a mechanism for provoking students into discussing with each other.

I think starting off a course with straightforward "right or wrong" content questions is a bad idea. I'd rather give them an immediate taste of an interesting, controversial, argumentative question that raises more questions than it resolves. Last time I taught Conceptual Physics, I started off with a 10-minute narrative about an accident on a roller-coaster at an amusement park where a teenager got seriously injured, (true story), and then pose a simple clicker question: "Was the designer of the Triple Hurricane [roller-coaster] at fault? 1. Yes; 2. No." That starts quite a debate, that begins with ideas of self-responsibility but gradually evolves (with some careful nudging from me) to ideas about banking curves and inertia. Boom: Newton's first law has now been motivated. :)

Wendy Adams, *Colorado State University-Physics*

Last year I described how the course would be taught and why on the first day with the syllabus. I immediately had pushback. A week later I showed a CU clicker video which really helped but I still had a sizable fraction (~30%) of the class that didn't like it at all.

This semester I skipped ALL mention of how I'm teaching the course and why it works. This year I have seen no sign of push back. Zero.

While this is anecdotal, it does suggest that it might be beneficial to skip the discussion of why you're teaching the course the way that you are.

Brian Katz, *Augustana College-Mathematics*

See Brian's first day activity, "What do you need to know?" in the "activities" files.

I should say that I've been burned by giving a mini-speech about how the course is going to function. It's been my experience that this frames the course activities as

something that the students should find undesirable and should resist by default. Instead, I simply ask the students to stand and work at the board in small groups, as they will do every day in class. At the end, I say that this is what class will be like. I generally ask the students to read a syllabus that might contain a more detailed picture that night, AFTER they have this experience. I have also had positive results from including reflection assignments about the structure of the course that include reading some research about how learning works; for example, see Ch5 of Ken Bain's new book "What the Best College Students Do", which is about "messy problems".

DJ Wagner, *Grove City College-Physics*

I talk about how the materials (McDermott Tutorials, labs based on Real-Time Physics, etc.) are based on substantive research into student difficulties and have proven to be more effective than traditional activities in helping students learn difficult concepts.

I discuss studies that have shown that making predictions help you learn and remember physics better. Sci Am even had an article (I think this summer) that showed that even truly random "predictions," to questions such as "what color will the next dot be?" with randomly-generated answers, improved memory of what the answers were.

I talk about how collaborative group-work skills is an ABET standard and thus important for the engineers to develop (for classes including engineers). I mention that in the work force you will be working with folk who have different backgrounds and different strengths than yourself and you'll need to describe your expertise and be able to press others to better explain theirs. I also mention an informal survey I conducted at our Career Fair, when I asked any employer who would talk to me (not just those seeking technical majors) what they looked for. Two themes emerged, across discipline: the ability to work collaboratively in a mixed-background group, and an out-of-classroom research/internship/etc. experience.

When using Clicker Questions, I relay a few anecdotes from Mazur's book.

The Hake study is always a good thing to cite too – professor experience/popularity doesn't affect normalized gain on conceptual evaluation, but the amount of active engagement in the classroom does.

Mark Maier, *Glendale Community College-Economics*

Although it is beneficial to explain to students why collaboration is a worthwhile classroom pedagogy, I find it more effective to structure initial lessons so that students *experience* successful collaboration. In this way, students practice pair work and small group work in a scaffolded manner before being asked to do so on their own. In particular, students need assistance with group formation, equal participation, individual accountability and positive interdependence (components advocated by Spencer Kagan as essential for effective classroom group work; see also "Cooperative Learning" at the Science Education Resource Center, http://serc.carleton.edu/introgeo/cooperative.)

The first small group activities are designed so that positive interdependence

(students need input from one another in order to complete the task) occurs within the task itself. Such activities include students surveys that requiring data from each student and jigsaws that require answers from each group member. Looser structures often create a situation in which students inexperienced in working together can complete the activity better on their own. As result, students see no reason to collaborate. Activities that build in positive interdependence demonstrate to students the effectiveness of group learning more effectively than my exhortation about the importance of collaboration.

Paul Camp, *Georgia Gwinnett College-Physics*

In my experience, by the time students reach college they have learned how to operate school and violating their expectations carries risks. The first time I did it, my class rebelled and I got in serious trouble with my dean – serious enough that I had to leave that job.

Since that time, I've always spent the first day of all introductory classes giving a brief overview of some basic ideas of cognitive science and what they imply for effective learning environments. I tell them I give the best lecture on why lectures are bad that they'll ever hear (though lectures aren't always bad – you just have to be ready to hear information as opposed to me being ready to tell it to you – a need to know has to be there first).

This almost always gets me over the hump for a few weeks. However, it is not a permanent fix unless students perceive their skills to be improving as a result of the course. I have a variety of ways of accomplishing this, but they all form a cycle of feedback and reflection. I often use rubrics, similar to those used by Eugenia Etkina, but I use them in the following way.

1. A student receives their assignment and the grading rubric that will be used at the same time. When they complete their assignment, the self-assess using the rubric. I expect they mostly will score themselves high since they wouldn't deliberately hand in something substandard. The only low scores they give themselves are things they totally didn't know how to do.

2. I assess using the same rubric. My scores are generally very different from theirs. I give a short list on the rubric of the things I looked at to determine my scores.

3. They write a short reflection to figure out why my scores are different from theirs. If they did something wrong or incomplete, what was it that led them to think it was right? If they missed something, how should they have thought? They should also project forward to the next part of the class and explain what they will do differently and why.

This allows students a moment for metacognition. They get to assess the quality of their thinking rather than the product, identify shortcomings, and plan for improvement

I do almost always see improvement, and I do tell them that grades will be based in part on the magnitude of their improvement and not just a straight average of all their grades. This adds practical value to improving in addition to the satisfaction of getting better at your skills.

I should note, however, that many of the things I assess are process skills rather than content – aspects of being a scientist that are distinct from the scientific concepts themselves.

John Hubisz, *North Carolina State-Physics*

From over 50 years of teaching, I learned long ago that physics students "know" how I am supposed to teach.

I have to set them up for interactive teaching. My first day, I ask for questions and get none. I wait 25 to 35 seconds and maybe get an older student to pose a lukewarm question. I then require each student to turn in a question on a quarter sheet of paper that had always wanted to ask, but never did. I collect the questions and start answering them, even the craziest of questions. They learn quickly that i am serious about asking their questions and should have no fear of asking questions in class. Within four weeks, I have no problem getting questions from students during my classes.

I also present a question for the students in groups of three to answer. They think that they need to go elsewhere to get information in order to answer the question. They don't. Members of the group have pieces of information that will help and at first they do not realize it. Last year I asked them to determine the number of people per square meter in the 48 states. In this question, you can see that there has to be a conversion of units. Someone will know how or someone can guess. As to the dimensions of the U.S. someone will have a rough guess usually in miles and when they get the required number, they are surprised that so many groups came up with roughly the same answer even though the guesses that they made were slightly different. There are lots of Fermi Question collections out there.

Each class day I have wide variety of activities that require the groups to report on one sheet of paper with their names on it. At first the write-ups are poorly written (incorrect grammar, bad spelling, etc.). When I turn those back in with comments, they improved quite quickly. The activities might be a 25 words or less description of what I have been talking about, a solution to a problem on the physics of the day, an answer to a question about a video clip or demonstration just done, etc.

Leslie Bowman – Online Instruction

Excerpted from a discussion on a LinkedIn group.

After trying many first-day activities and handing out a survey at the end of the class and again three weeks later about the first class, I was not surprised to learn that students hate ice-breaker, introduction types of activities. They hate having the syllabus read to them. They are either there because they have to be or because they want to be. And nothing we do the first day changes their perception of the class. It's what we do the first few class meetings that reinforces or changes how they feel about the class.

To that end, I jump right in to the course content after introducing myself. So many students do not have the text in the first class session so I give a short introduction to some aspect of the content for the week and send them to the computer lab for 15 minutes to locate current events related to what I introduced. Then they come back, get in groups, discuss, then share with the class.

For the second hour, we repeat the process with more info that I give in a 5-min

mini- lecture. And off they go again, this time in pairs or small groups. See, they're getting to know each other already.

Ditto the third hour. The final parting shot right before class ends is my take home syllabus quiz that is twice as long as the syllabus, a reading assignment with questions to prepare in writing for the following class discussions.

Bottom line -- they LOVE this. And by the next class meeting, they know the syllabus up one side and down the other and I've never said a word about it.

Why waste time with ice-breakers and introductions? As a student, I hated all that wasted time. And I'll wager that if you give a short survey to your students, you'll find they hate it too. Just one more boring first day.

Try something new and wake up, motivate, and interest your students in the content. Starting out with students working together to complete tasks related to content creates the beginning of a community of practice that grows exponentially through each class meeting (provided you continue with problem-solving, task-related activities).

Stephen Ranson

Excerpted from a discussion on a LinkedIn group.

I have my students get to work right away, engaging in meaningful dialog and activity as much as possible. This includes using the service Socrative to collect interesting information about them and sharing it back with them instantaneously to drive conversation. Socrative is free, easy to use, and runs on all devices. So, my students use their phones to participate. http://www.socrative.com

I also use some of the great ideas here with modification

http://www.facultyfocus.com/articles/teaching-professor-blog/first-day-of-class-activities- that-create-a-climate-for-learning/

Since I teach some classes in computer labs, I've done a modified version of this great Speed Dating activity that uses a shared Google Doc. Students create their own interesting profile on a shared Doc. Then, after skimming everyone else's profile, they find at least 2 others that they follow up with.
http://www.facultyfocus.com/articles/effective-classroom-management/love-the-one-youre- with-creating-a-classroom-community/

Anton Tolman

Excerpted from a discussion on a LinkedIn group.

I do a quick ice breaker mostly asking students why they are taking the course; I don't usually accept "it is required" -- I ask them to give another reason. Then I lead a class discussion based on Gary Smith's "first day questions" from the National Teaching and Learning Forum (www.NTLF.com). Those questions basically ask students what they see as the purpose of their education and this course (acquiring information, learning to use that information, or developing lifelong learning skills).

The students vote and then we have a discussion about that.

Depending on time, I either break the class into groups and have them review the sections of the syllabus that typically confuse students; each team has to come up with 3 questions they want clarification on and then we go round-robin to answer the questions. This not only builds community, it signals that this is not a lecture and go class. OR I have them vote, by teams, about the remaining chapters we will cover for the semester.

Prior to the first day of class, I post a "draft" syllabus that has blanks for the reading assignment for about half of the weeks. I pick about half of the chapters and the class picks the other half. This is partly modeled on Mano Singham's article "Death to the Syllabus". We have a discussion about why I picked the chapters I did, and I give my own feedback on the remaining chapters which they can listen to or disregard. The teams typically have vigorous discussion about which chapters they want covered, and then we vote, and I post a final version of the syllabus on our LMS. I generally try to do both of these things, but we often have to wait until the 2nd day for the syllabus vote -- students have a say in the class; their thoughts matter. For some classes, in the first two days, I will also use a KWL exercise because students come to my classes with lots of misconceptions and stereotypes.

Daniel Anderson

Excerpted from a discussion on a LinkedIn group.

I start by passing around a strange little craft-object-thingy. I take it from student to student and ask each of them what their name and major is then I ask them to ask a question about the object. This can take a few minutes because they sometimes have to struggle to form a question. Then, if there is time, I pass it around again and make them do it over.

This does two things for me. First, I get to put names and faces together and they get to introduce themselves. Also, it offers me an opening to talk about question-based education, which is what I prefer. I really value student engagement and this little (sometimes frustrating) exercise helps me establish it at the outset of class. I also think that it makes the course seem a little less like a business and a little more about personal curiosity, which is better for student engagement in the learning process.

Thomas Carey

Excerpted from a discussion on a LinkedIn group.

The activities you choose are determined by your Goals for the First Day of Class. For help in aligning your goals and activities for the First Day, check out the guides, video cases and worksheet in the open educational resources at http://elixr.merlot.org/case-stories/course-preparation--design/first-day-of-class

Dee Fink

Excerpted from a discussion on a LinkedIn group.

Being a faculty developer for 25 years, I learned that the first day of class is

CRITICAL. If you doing anything unusual or innovative, you need to prepare students for that quickly; otherwise, they will resist and fight back the whole semester. And even if we aren't doing anything unusual, we need to help prepare students to do serious learning, if that is what we want.

One strategy for that are the "first day questions" that Anton Toman mentioned above. That activity guides students through re-thinking the questions of (a) what they see as important kinds of learning and (b) the kinds of learning activities that will help them learn that.

A second major strategy, created by Stephen Carroll at Santa Clara Univ., is to guide students through a re-thinking of who they are, why they are in college, why they are in this class, etc. Stephen has taken time to create a partially animated video of what he does, and put it on YouTube: http://www.youtube.com/watch?v=kM-DXWEns2Y (Part I) and http://www.youtube.com/watch?v=W-2ZOkO_s6Y (Part II).

In his words, since he started doing this 6 years ago, his students do MUCH better work in every respect, than they did before. That is, this exercise really motivates and guides students to be better "self-directing learners"!

http://meta-learning.org