Converting a Traditional Class to Active Learning

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Creating an active learning classroom can be done all at once, when creating a new class, or it can be done slowly, changing an existing traditional lecture course over time to embed increasing amounts of active learning. The first approach works well if a faculty member can devote an entire summer to course development and be compensated for the effort. However, that is not always an option. In this chapter, we present some strategies and advice related to the second option: incorporating more active learning into a classroom over time.

The main goal is to have students more actively engage in the course material, ideally getting them to the higher levels of Bloom's taxonomy: synthesizing, applying, evaluating, and creating. These higher-level cognitive processes require that students have consumed the basic contents and facts needed before class. While there are a variety of ways to adopt and increase active learning, the flipped classroom or partial flipped classroom approach is ideal because it provides a structure in which students consume some or all of the course content at home by reading and/or watching videos (Auster & Wylie, 2006; Gannod, Burge, & Helmick, 2008; Gehringer & Peddycord, 2013; Lockwood & Esselstein, 2013; Moravec, Williams, Aguilar-Roca, & O'Dowd, 2010; Toto & Nguyen, 2009). This practice replaces some or all of the traditional lecture and provides the time in class needed for active learning activities. The learning activities may be completed individually, in pairs, or in groups, depending on the goals and setup of the class. Creating such classes brings about challenges in four areas:

- Course Selection: Which classes work well with this approach?
- Content Creation: How do you make/find video content for out-of-class consumption?
- Activity Design: How do you design effective active learning techniques for in-class?
- Group Formation & Incentives: How do you encourage students to work together effectively to form productive groups for active learning? How do you set up an incentive structure to ensure students do all of the work?

These types of questions are asked when designing a brand-new, fully flipped classroom from the ground up. But in this chapter, we look at how to address these questions when engaged in the slow game of converting an existing class to active learning over the course of several semesters.

Course Selection

Whether the goal is to improve the learning outcomes or to create a more satisfactory teaching experience by adding active learning, one of the first decisions is with which course to begin. In almost any discipline, there are courses that lend themselves more clearly and easily to active learning. For instance, a course that has obvious hands-on activities or obvious skill development goals is optimal. These courses often already have a few active learning activities built in, and so in some sense already have a transition to active learning. Taking such a course and migrating it to a fully flipped active learning course may take time, but it is more likely to be successful. If the first experience is successful, your confidence will increase as an active learning instructor. In addition, this will provide the opportunity to see what works well and what does not for students in a specific discipline and teaching environment. This chapter showcases several examples of slow migrations toward active learning, starting with an easier class in which to incorporate change.

Dr. Celine Latulipe took this approach when she first began her active learning journey. She slowly transformed the Rapid Prototyping and Design Patterns course in the College of Computing and Informatics into a fully flipped active learning (FFAL) course. This process took place over three semesters. There were hands-on activities that could be conducted in class, but to make time for these, the theoretical content had to be delivered outside of class.

Dr. Molly Redmond initially taught her introductory ecology class as a mostly lecture-based class, but over several semesters, she began to increase the active learning components each time she taught the class. She started by using clickers and has been increasing the number and length of other class activities each semester. Redmond is using a similar, though greatly accelerated, approach in her genetics class this semester.

Content Creation

One of the biggest challenges in moving toward an FFAL course (or even a partially flipped course) is the amount of work involved in creating video content for students to consume outside of class to deliver the facts and knowledge students need, so class time can be spent on active learning activities. The split here reflects Bloom's taxonomy, with the students doing the cognitively easier, lower-level activities on the taxonomy (gaining facts, knowledge, and understanding) at home, and then coming into class ready to engage in the more challenging, higher-order learning activities (synthesis, application, evaluation, and creation). In the past, students were expected to read the textbook before coming to class, and that is still often part of the preclass prep work in active learning. However, for many courses, faculty have found it most effective to create or source videos for content delivery. Modern students are of a media generation: They prefer videos, which can be watched while multitasking, and want the flexibility to watch at any pace, multiple times if necessary.

Thus, the challenge for the faculty member is creating or sourcing the videos. There are four approaches to this part of the course transition.

- Extra Credit Video Curation: In one semester, offer an extra credit project to students in which they find videos that present the topic being covered, and write a summary of why that video works well to present and/or reinforce the material. Ask students to create a few quiz questions that test a student's basic understanding of the material. The videos can then be reviewed and assigned to students the following semester in place of a lecture, allowing more time in class for active learning.
- Summer Credit/Independent Study Curation: Have one or two students work over the summer or as an independent study to gather video materials and develop quiz questions that help move a class toward a flipped structure. Be sure to assign students who have just taken the course so they are familiar enough with the material. The project will help the students solidify their own learning of the topic as well. Having a few students engaged in the project together allows them to test the quiz questions on each other. These videos can be worked into the course the following semester when the instructor has been able to develop an active learning module for the class.
- One Video Per Week: In a typical class with two lecture periods per week, choose one of the lectures each week to make into a video or a series of short videos that cover the material. Then, use those videos in the present semester, freeing up one period per week for active learning. The next time the same course is taught, the material from the second lecture period each week can be converted to videos. This strategy can be stretched out over three or four semesters. By the end, the instructor has an entire series of videos that solve the content delivery challenge and is free to focus on developing challenging in-class learning activities.
- Student Video Creation: Add a project to the end of a course asking students to produce high-quality video that explains a core course concept. It may be likely that only some of the videos will be good enough for use in future semesters, but doing this repeatedly over several semesters will generate enough quality videos. And in this case, the students will be watching their peers explain concepts, which might be more fun and engaging for them.

Activity Design

Clickers/Poll Everywhere

One of the simplest ways to introduce active learning techniques into a large lecture class is by using clickers (Caldwell, 2007). UNC Charlotte currently contracts with Poll Everywhere, a software platform that can be used on mobile phones, tablets, or any device with a web browser and Wi-Fi connection. This simplifies use, as students no longer have to purchase a standalone device and remember to bring it to class. Additionally, clickers can be used just once or many times during a class period and can be used in several different ways:

- Recall Questions: These are often used at the beginning of class to remind students of material discussed during the last class period or a concept introduced earlier in the semester that they need to remember to make sense of that day's topic.

- Surveys: Clickers are useful for surveying on matters relevant to course administration (e.g., What topics should I review before the exam? How much progress have you made on the assignment?). They can also provide insight into student experience and opinions about the course material (e.g., How concerned are you about climate change?) and be used as a prompt for students to defend a particular point of view when discussing a controversial topic where student opinion will reasonably differ (e.g., Should pandas get priority for conservation?).
- Concept Questions: This is the type of question Redmond uses most frequently in her biology classes. Many of these questions are designed to address common misconceptions (e.g., plants take up carbon from the soil). She designs these questions based on personal experience with the class and studies on common misconceptions in ecology and genetics (Wilke, D'Avanzo, Anderson, Schramm, & Hartley, 2011; Parker et al., 2012; Smith & Knight, 2012; Briggs et al., 2017).
- Problems: Genetics problems can be posted with multiple-choice or open-answer options. Problems can be worked on the board by the instructor or a student after the students respond, but when explaining the answer, it helps to have a sense of how many students were able to get the correct answer on their own.
- Clicker Case Studies: These involve a series of clicker questions applied to an interesting example and are usually a mix of the types of questions mentioned above. They can be custom designed, pulled from a textbook, or modified from examples available online.

For all types of questions, students can be encouraged to consult with their classmates before answering. In Redmond's classes, students receive credit solely for participation, and they are allowed to miss 10% of the points with no grade penalty. Redmond also allows students to leave a note at the end of class if their clicker malfunctioned or they were not able to get an answer in on time, which happens to about 5–10% of students each class period. Those policies reduce stress associated with not being able to figure out the correct answer quickly enough and inevitable technical mishaps.

Mixing Activities and Lecture

If not moving to an FFAL course, faculty members can intersperse activities and lecturing. Redmond has used a mix of short (2 to 10 minutes), medium (10 to 30 minutes), and long (30-plus minutes) group activities, gradually increasing both the number and length of the activities. The short activities are informal and almost always of her own design, and they are usually group discussion questions followed up by whole-class discussion. The medium length activities are completed in class and may be turned in for a small amount of credit. Some of these activities require students to complete an individual component in advance, like calculating their carbon footprint, participating in a citizen science bird count program, or reading an article on the costs of climate change. Students turn in the individual component on Canvas before the group activity in class. Then they share the results of their individual activity to

come up with a group synthesis. The longer group activities take more time to develop and can be a mix of activities designed by the instructor and activities modified from other sources. Some of the sources useful in biology courses include the textbooks, the InTeGrate Project (InTeGrate Project, 2019), and the National Center for Case Study Teaching in Science (National Center for Case Study Teaching in Science, 2019).

Wrap Around a MOOC

One way to ease the burden associated with developing a fully flipped class is to make use of full-scale resources that are online and freely available. With the advent of massive open online courses (MOOCs), it is possible to structure a face-to-face or blended class around existing MOOCs, augmenting and personalizing the learning experience with content that is relevant to your students. This strategy has a name: the small, private, online course, or SPOC, and it is growing in popularity as institutions of higher education attempt to leverage the power of great lectures available for free on MOOC platforms (Fox, 2013).

This technique of wrapping around a MOOC has been used in the Human–Computer Interaction (HCI) class in the College of Computing and Informatics (CCI) at UNC Charlotte, making use of the HCI class MOOC offered through Coursera. The videos on this MOOC were created by Dr. Scott Klemmer, a professor who was at Stanford University at the time, but is now at the University of California, San Diego. Klemmer gave permission to the computing faculty at UNC Charlotte to use his videos for their flipped, active learning HCI class (Russell et al., 2013). These videos have been supplemented with a handful of other videos created by the faculty in the CCI to augment the material and to highlight areas of the topic that Klemmer did not cover. Students watch these videos before coming to class and then engage in active learning design activities in class, applying the principles of HCI design to a variety of design problems.

The benefit of the SPOC model is that companies like Coursera have poured resources into creating high-end video lectures covering entire course curricula. Often the lectures are even interspersed with interactive questions. Importantly, the lectures are often given by preeminent scholars in the field. Thus, by wrapping a course around such a set of videos, a faculty member can save time and still be reasonably assured that the students are getting a good presentation of course content. The faculty member can then devote time to creating supplementary video material and to designing effective active learning activities to engage the students in the topic in the classroom.

Group Formation and Incentives

One of the strategies that can be used to slowly phase in active learning is short group activities or discussion questions interspersed with lecturing. While this is effective at breaking up lecturing, the transitions can sometimes be difficult. It is important to differentiate a transition to group work, as opposed to just asking questions generally. This can be accomplished both verbally and by notation on lecture slides. It is also necessary for these activities or questions to be written very clearly since there is usually not enough time to go around the room to take

questions. If students cannot figure out what the instructor is asking, they do not engage in discussion. After a successful discussion, it can also be difficult to get the class to quiet down for the return to lecture. Using a clicker question to survey group responses is one good way to get everyone's attention and signal that group discussion time is over.

Dealing with expectations for group work when it is a relatively small portion of the class time or of students' grades can be challenging. When group activities are short enough to be completed in one class period, it generally makes more sense to form new groups for each activity, as different students are in attendance on different days. However, students generally form groups with the students sitting near them, so group composition often remains similar, but not identical, from activity to activity. While a student who was not happy with the efforts of their fellow group members certainly could join another group, many students appear to decide that it is not worth appearing rude when the stakes are fairly low. Many groups function well, but there are always some in which students are not participating; therefore, there are complaints from the students who feel that they did a disproportionate amount of the work. Capping the group size at four students appears to reduce the number of students who join a group but do not fully participate. Assigning permanent groups where the students are accountable to each other over the course of the semester might also help, but this could be problematic when students miss class on the day of an activity. Permanent groups are essential as group work becomes a larger portion of the class grade, and activities extend over longer time periods.

Conclusion

For faculty members new to active learning, gradually adding active learning components into their lecture-based classes will be more manageable than developing an FFAL course all at once. For students unaccustomed to active learning approaches, it is less overwhelming to take a hybrid approach and may lead to greater student acceptance. We encourage those interested in trying active learning to use these strategies to make the transition over multiple semesters or to simply increase the amount of active learning in a class that retains traditional lecture components as well.

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