CAMPUS TECHNOLOGY

Tech-Enabled Learning | Feature

6 Expert Tips for Flipping the Classroom

Three leaders in flipped classroom instruction share their best practices for creating a classroom experience guaranteed to inspire lifelong learning.

- By Jennifer Demski
- 01/23/13

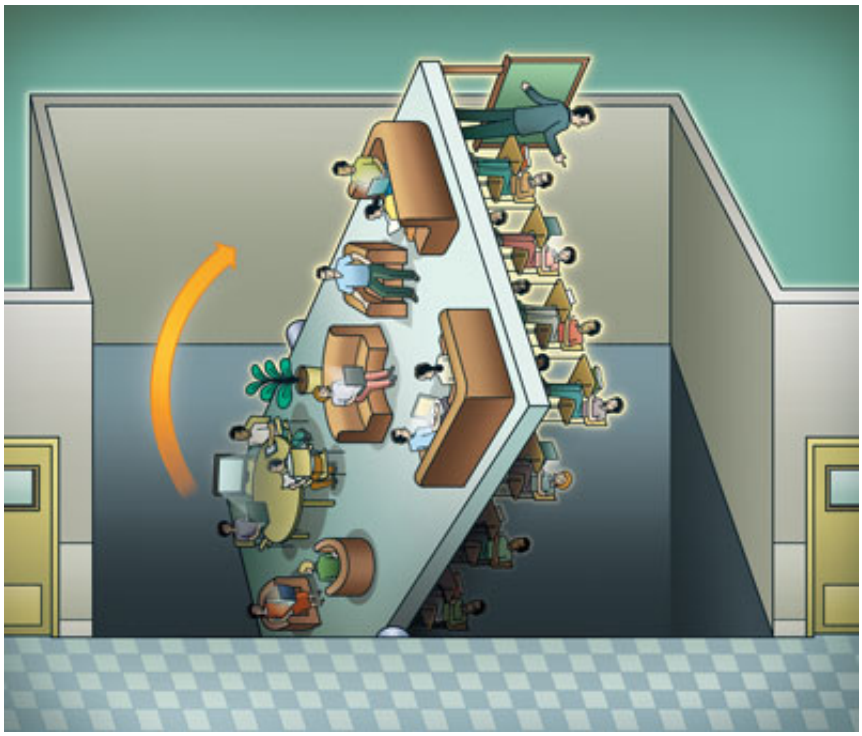

Illustration by Peter Hoey

"If you were to step into one of my classrooms, you'd think I was teaching a kindergarten class, not a physics class," laughs Harvard University (MA) professor Eric Mazur. "Not because the students are children, but because of the chaos and how oblivious the students are to my presence."

Such pandemonium is a *good* thing, insists Mazur, an early adopter of the flipped classroom model that has become all the rage at colleges and universities across the country. "That's how we all learn: by actively engaging in the material rather than sitting in a classroom and writing down the words said by the professor."

This story appeared in the January 2013 digital edition of *Campus Technology*, with two exclusive video interviews.

In a flipped classroom, professors assign pre-class homework consisting of brief, recorded lectures and presentations, digital readings with collaborative annotation capabilities, and discussion board participation. This frees up classroom time to promote active learning through collaborative, project-based learning using simple display and sharing tools.

"The flipped classroom has become increasingly popular lately because there are so many new technologies that make out-of-classroom content creation a little bit easier," notes Chris Millet, assistant director of Education Technology Services at Penn State University. "And there are drop-dead-simple technologies that keep the flow of idea generation and exchange moving inside the classroom to support active learning."

While technology facilitates flipped instruction, it takes both planning and experimentation to perfect the model. *CT* asked three experienced classroom flippers for their tips and best practices.

1) Use existing technology to ease faculty and students into a flipped mindset. "The technology needs to support really easy creation of the material, and allow for easy access by the students," explains Millet, citing lecture capture as a good starting point. "A lot of lecture capture technologies support things like searching within slides, bookmarking, annotations, and collaboration within the platform, so I think that's a really good baseline technology to support a lot of the pedagogy that we talk about with flipped classrooms.

"I've been spearheading our lecture capture initiative here at Penn State," he continues. "Our strategy for lecture capture was to get faculty using these tools to record instructional content as a way to get their feet wet, and then use that as the first step toward encouraging them to record content outside the classroom for flipped instruction."

Faculty use the same distribution method with lecture capture that they'd use to distribute pre-class instructional materials to students, notes Millet, so both faculty and students are already familiar with the technology. "It's all integrated into the LMS, so it's really easy for the students to know where to get that pre-class content, since they've already been accessing recorded lectures from the traditional classroom."

2) Be up front with your expectations. "Students come in with a specific mental model of how a classroom ought to work that is quite ingrained," remarks Robert Talbert, a professor of mathematics at Grand Valley State University (MI) who's in his first year of teaching in the flipped model for his Communications in Mathematics course. "It starts with the professor telling them what to do, and it ends with the professor telling them what to do. When you invert that situation and make them active participants, it really takes a long time, a lot of repetition, and a lot of marketing to get students to buy into this."

In order to get students on board, faculty need to be clear and enthusiastic about the flipped model. "Prepare to be the marketer for that particular mode of instruction," exhorts Talbert. "It takes a great deal of positivity, and every day you need to discuss with your students why we're doing it this way and not the traditional way, what the benefits are, what they're getting out of this that they wouldn't be getting if we did the traditional lecture style, and so forth."

3) Step aside and allow students to learn from each other. "Pre-class, my students access digital readings using a web-based, collaborative PDF annotation tool called NB, which was designed by MIT," says Mazur. "I have been truly impressed by the energy with which my students dive into the readings. I thought I would need to give much more extrinsic motivation [for them] to do that, but

the answer is no, not at all.

"Within a couple of weeks, my 35 students created 2,000 annotations in their text, discussing the readings asynchronously with each other. Their discussions were incredibly thorough, exciting, and in-depth. Yet, every time I participated in the NB annotations, I killed the discussion among the students, because I was seen as the authority. It stopped them from working it out on their own and finding the solution. [Now] I participate only if there is a situation where they are completely and utterly stuck."

4) Assess students' understanding of pre-class assignments to make the best use of class time. "Running a flipped classroom requires an agility toward what you teach," says Talbert. "In a traditional classroom setup, you prepare a lecture, and that lecture does not change between making it and giving it. Whereas, with the flipped classroom, I'm not really sure what my students are going to need to know once I get there. It doesn't make sense for me to prepare a lecture that covers the entire set of material. They may be really good at all of it and can jump right into the problem solving, or maybe they're stuck on one point that we really need to drill into."

In order to be more responsive to students' specific needs, Talbert uses clickers to conduct a quick quiz on the pre-class material at the beginning of class time. "I'm able to see what I need to do at the line of scrimmage to really target what they need," he explains.

He also monitors students' understanding of course material via the web. "My students use discussion board software called Piazza to post questions and comments as they're reading, and every morning I scan through their discussions to see how they're doing. Oftentimes, misconceptions can get cleared up just through students answering each other's questions." When the software reveals that a lot of students have questions about one particular issue, Talbert can then cover the material in class.

He admits the flipped model requires more flexibility on the part of the professor. "With the flipped classroom, I can't plan; I can only anticipate," notes Talbert. "I've taught the class enough in the past to know where the trouble spots are going to be, but really I have no idea what's going to happen from one day to the next. That's what makes it interesting and exciting to teach."

5) Set a specific target for the flip. "When a professor comes to my office and says he wants to try the flipped classroom model, we'll start by thinking about the pedagogy," remarks Millet. "We'll look at the class to determine what problems [the professor is] trying to solve. And, maybe, as an introduction to classroom flipping, we won't try to flip the entire class, but identify particular units where students could really benefit from this model. Then we look at what technologies could solve the problems that we've identified." In a STEM class, for example, the technologies need to support annotation, mathematical equations, and other scientific concepts, whereas a liberal arts class might need more support for capturing audio and video.

6) Build assessments that complement the flipped model. The prevalence of teamwork in a flipped classroom presents an assessment challenge. To tackle the issue, Mazur developed a cloud-based classroom-management system called Learning Catalytics, inspired by a technique developed for team-based learning called IFAT (instant feedback assessment technique). Students log into the system for individual and group-based assessments.

Managing the Flipped Classroom

When it comes to flipped classrooms and learning management systems, there's no need to fit a square peg into a round hole. In 2011, Harvard (MA) physics professor Eric Mazur launched Learning Catalytics, a cloud-based classroom-management system designed specifically to meet the needs of the interactive classroom. The solution allows professors to create robust questions that students can answer on their personal mobile or computing devices.

"You can ask students to graph a function; you can have them look at a painting from the Renaissance and identify certain components; you can have them read a piece of text and highlight specific points; or you can do a free-response question--and the system will analyze their entries," explains Mazur.

The software quickly aggregates and displays student responses--even displaying students' answers based on where they're sitting in the room--allowing professors to tailor interactive classroom time to students' needs. Mazur and his team are beta-testing an assessment component that broadens the instant feedback assessment technique (IFAT) standards beyond multiple-choice questions, allowing professors to create assessments that are also interactive opportunities for learning.

Because the Learning Catalytics system is cloud-based, professors have access to questions created by fellow users, and global student-response data is stored for each question. "The data analytics capabilities of this system are just phenomenal," enthuses Mazur. "In a sense it's like having Google--not for searching content of the web, but rather for mining educational data." In its first year online, Learning Catalytics has built up a user base of 1,260 courses, run by professors from around the world.

"Six times a year, my students come into class, they sit around the table, and they each log on to their device," explains Mazur. "They have anywhere from seven to 10 questions that they need to answer. They work on it individually for about 25 minutes. They're allowed to Google anything they want, but they're not allowed to collaborate with others on that part.

"After 20-30 minutes, I flick a switch on my device and the system switches to team-based mode. Now, if I'm a student sitting at a table with three of my peers, each of our devices displays what the others at our table have answered for each question. Then, as a team, we have to re-answer the questions, but now we can submit only one answer for the table." As students discuss and agree upon their answers, they learn from each other, says Mazur.

"If you were to walk into my classroom during that collaborative part, and I were to tell you that the class is taking an exam, you'd look at me as if I were from Mars," he jokes. "You'd see students cheering if they've gotten a right answer, talking to each other, working together, and stepping to the movable whiteboards to demonstrate their points. It's very chaotic, but what happens is that, at the end, the students know their scores instantly. And most importantly, they've learned. The assessment has become a learning opportunity."

Why Flip?

Robert Talbert, a professor of mathematics at Grand Valley State University (MI), was drawn to the flipped model because it requires students to be active agents of their own learning, rather than rely on the expertise of their professor. "The whole point of college is to learn how to teach

yourself--that's what the rest of your life is going to require," he insists. "You have to know how to find your own resources, make sense of them, and then put them to work as best as you can."

In a flipped classroom, a professor is able to teach both content and process, he explains. "The kinds of problems that people with degrees in mathematics get hired to work on are amorphous and poorly defined," Talbert continues. "A lot of the problems my students will face don't even exist yet. We can't just focus on content coverage. We have to teach the ability to adapt and evolve along with the problems."

It's a sentiment echoed by Eric Mazur, a professor of physics at Harvard University (MA). "Learning is a two-step process," he says. "First, you must have some transfer of information; second, you must make sense of that information by connecting it to your own experiences and organizing the information in your brain."

In a traditional classroom, the transfer of information happens during class time, and the student is left to process the information on his own. "About 22 years ago, I realized that we professors were focusing on the easy part--the transfer of information--rather than on the harder part, on helping students make sense of that information," remarks Mazur.

With two decades of experience, Mazur can attest to the success of the flipped classroom model. "When I taught using traditional lectures, I got high ratings, but students didn't learn even the most basic things in class," he admits. "The only thing they were able to do was regurgitate information." In a flipped classroom, Mazur's students learn physics outside the classroom so that they can apply that information to collaborative, real-world projects, such as developing a Rube Goldberg contraption or planning an unmanned mission to Mars.

"The students get excited about the projects because they apply to the real world, but in order to complete a project, they need to learn the physics," he says. "They quickly realize that if they don't participate in the pre-class homework, then they're not able to participate in a meaningful way on these collaborative projects in class. The driving motivation for learning then becomes an intrinsic one rather than an extrinsic one. It's amazing how well it works."

About the Author

Jennifer Demski is a freelance writer in Brooklyn, NY.