

Flipped learning helps teachers move away from direct instruction as their primary teaching tool toward a more student-centered approach.

Flip Your Students' Learning

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When educators hear the terms *flipped classroom* and *flipped learning*, typically the first thing they think of is a teacher-created video that students watch at home, as though that were the essential ingredient.

It's not. Flipped learning is not about how to use videos in your lessons. It's about how to best use your in-class time with students. That insight is causing educators in classrooms from kindergarten to college to reevaluate how they teach.

The Best Use of Face Time

Where in the learning cycle do your students most need you face-to-face? When you're introducing the subject matter in a lecture? Or after they've taken in this information and are struggling to understand and apply it?

For many teachers, lecturing may not be the best use of their in-class time. When they're lecturing, they may be delivering important content to students, but they're not working one-on-one with students, they're not necessarily engaging students in higher-order thinking, and they're not differentiating instruction.

But teachers *would* have time to do these things if they could shift direct instruction onto a teacher-created video

and have students watch the lecture at home. And that's where the flipping comes in: Instead of coming to class to watch the teacher lecture and then going home to practice what they learned—thus the word *homework*—students watch the lecture at home and then come to class to practice what they've learned—that is, they're now doing homework in class. Freed from delivering whole-class instruction during that hour or so, the teacher can deliver targeted instruction to students one-on-one or in small groups, help those who struggle, and challenge those who have mastered the content.

Not all classrooms lend themselves to flipping. Courses that are more Socratic or inquiry-based, or those that don't have reams of factual content for students to learn, aren't particularly suited to flipping. On the other hand, courses that are more didactic, that consist of large quantities of content on the low end of Bloom's taxonomy—in the categories of *remembering* or *understanding*—will likely undergo a greater transformation in the flipped classroom model.

FLIPPED



for future learning—for example, to familiarize students with horizontal asymptotes in math (see www.sophia.org/unit-g-concept-1-7c-tutorial).

The idea of creating instructional videos is enough to stop some teachers in their tracks. But they're not that difficult to do. Although many people assume that when we say *video*, we mean that a video camera is recording us as we teach a class, what we actually use are *screencasts* (see "Making a Screencast" on p. 19). Screencasts capture our computer screen—our PowerPoints and so on—as well as our voices; they also include a small webcam of our faces and, in our case, a digital pen that is useful for lessons that involve mathematical problem solving. We record our lectures, which are approximately 10–15 minutes long, outside class time, wherever or whenever it's convenient. (To watch one of our recorded lectures, go to www.youtube.com/watch?v=m2DtOFnBEMk.)

Although the technology component has gotten a lot of buzz, the pedagogy underlying flipped learning is nothing new. For centuries, teachers have asked students to come to class prepared by reading a section of text. The flipped learning model simply leverages new technology to provide an audiovisual option to students as they prepare for class. More important, it redefines class time as a student-centered environment.

So what does this look like? Instead of starting off with a lecture, a class might begin with a question-and-answer time. We require every student to come to class with at least one interesting question about the video—a question they don't know the answer to—as well as the notes they took on the recorded lecture. The teacher gets to interact with each student, and students get to point out things they don't understand or simply wonder about.

What Comes Out?

After deciding where students would most benefit from face-to-face instruction, teachers then turn to a second question: Using technology, what can I remove from class to increase the value of face-to-face time? Most teachers who implement a flipped classroom choose to remove lectures and direct instruction—as mainly one-way communications, lectures lose little in translation to video. But traditional lectures are not the only activities that teachers can time-shift out of the class.

For example, teachers are creating videos to provide a basic overview

of an upcoming unit of study. (See a screencast in which a teacher introduces a lesson on William Blake at www.screencast.com/t/WPpnLEsn1n1).

Others use videos to pose questions to students; the students must then develop answers on the basis of what they saw. One teacher recorded students acting out the following math problem: A pizza delivery man ends up having to drive 538 miles to deliver a pizza; how long will it take him to get there if he's driving 45 miles per hour? (See this teacher-created video, "Driving to the Party House," at www.techsavvyed.net/archives/1931.) Still others create videos for content that is a prerequisite

Let's say that before coming to class, students viewed a video about scientific measurement. The teacher might open the class with a clicker poll or other check for understanding. Some teachers complete this check before class by using an online form to collect student responses and reactions to the video.

After addressing students' questions, the teacher might give the class an assignment based on the video. This could be a measurement activity, a problem set that students need to practice, or a real-world problem to solve that requires measurement. As

A recent article by technology blogger Scott McLeod (2012) also caused us to evaluate whether students needed to move through Bloom's taxonomy from the bottom up or whether, instead, they might start at the top and tap down into the lower end when they require some basic knowledge about a topic. We've found that both approaches work; it just depends on the learner and the learning objective.

Self-Paced Learning

We also were drawn to Bloom for another reason. As teachers start to flip

complete the various assignments when they're ready for them.

We also no longer require students to view a video at home; they can watch it wherever they have access to a computer or web-enabled device, in school or elsewhere. We post the videos on an online hosting site (such as Moodle or Blackboard); on internal district servers; and on the computers in the classroom. We also create DVDs of the lectures for students who select this option. This solves some of the issues regarding equitable access to technology at home.

Assessing for Mastery

Assessment under this model also changes. Instead of taking an exam and getting a permanent grade—perhaps the student didn't understand key components of the unit and got a *D* on a major test—students are required to demonstrate a minimum level of mastery before proceeding in the curriculum.

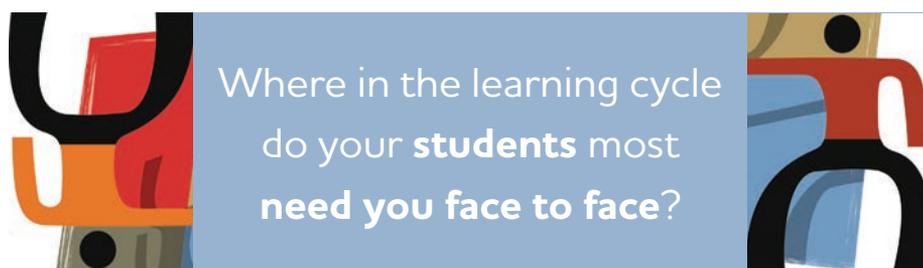
We also allow students to retake any assessment they've done poorly on. This provides students with multiple opportunities to demonstrate understanding of a topic if they're unhappy with their prior performance. It also helps remove some of the competitive and punitive components of assessment and of education in general.

Two Natural Fits

Universal Design for Learning

In light of the principles of Universal Design for Learning (CAST, 2012), which emphasize multiple means of representation, multiple means of action and expression, and multiple means of engagement, we began to rework how we managed our mastery classrooms.

We immediately realized that not all students learn best from video, just as not all students learn best by reading a textbook, listening to a lecture, or completing practice problems. To accommodate all learners, our videos,



students work independently or in small groups, the teacher has the opportunity to speak with each student about his or her understanding. The teacher is engaged in continual formative assessment, diagnosing on the spot each student's understanding and modifying instruction for each student as needed.

Enter Bloom and Mastery Learning

As high school chemistry teachers, we'd been flipping learning in our classroom for several years when we began to look closely at how the model meshed with Bloom's taxonomy. For one thing, we concluded that our instructional videos were valuable in shifting the lower levels of Bloom's taxonomy out of the class, enabling us to spend more class time at the upper end of the taxonomy, with tasks that ask students to apply, analyze, evaluate, and create.

their classrooms, they gradually build up a library of videos or screencasts of their lectures. It suddenly occurred to us that our students had an entire library of instructional videos at their disposal; they could now learn at their own pace.

To implement this flexible, self-paced system, we adopted a mastery learning system based on Benjamin Bloom's work (1985). Essentially, students must demonstrate that they have mastered a particular set of objectives before moving on to the next set. Other teachers who have flipped their classrooms have also found this approach valuable. Now, instead of all students viewing the same video on the same day, students view a video when they're ready for it. For example, perhaps students need more time to understand chemical bonding before moving on to chemical reactions; they

textbooks, problem sets, and other activities became optional resources for learning, rather than required activities. Students used the resources that best suited them to master learning objectives.

Traditional assessments also became optional. This is not to say that we stopped giving tests, but we did begin to allow students to demonstrate their understanding in any of several ways. They could create projects, design video games, develop presentations, design posters, curate blogs, and so on. Students were able to tap into their interests and strengths to demonstrate their understanding.

Project-Based Learning

Although we had always incorporated projects in our classes, we had done so *after* learning had occurred, as a capstone project (bottom-up on Bloom's taxonomy). We decided to offer projects as ways students could learn the material right from the start (top-down on Bloom's taxonomy).

In a project that one of us (Aaron) conducted with his class, students collaborated with a classroom in Canada to learn concepts about solutions, acid and base chemistry, and the mathematical analysis involved in the analytical process. In the past, Aaron would have taught the concepts before the project. Under the flipped-class, project-based learning model, students started with the problem to solve. They watched the instructional video when they required information, and they went to selected resources and supports when needed. Students who chose this approach met the same learning objectives as those who moved through the curriculum in a more traditional manner.

A Focus on All Learners

A student in Jon's chemistry class has an individualized education program

Making a Screencast

Equipment Needed

- *Screencasting software*, such as Camtasia Studio. The software records whatever is on your computer screen—a PowerPoint slide, your navigation to a web site, your pen strokes (if you're annotating on the computer).
- *A high-quality microphone*. Built-in microphones don't do a good job.
- *Pen annotation*, a must for teachers in mathematics and science classes. Microsoft PowerPoint has a pen annotation feature. So does any interactive whiteboard software.
- *A webcam*, if your laptop doesn't have one.
- *Recording software* that has a picture-in-picture feature that captures a webcam shot of you while you record.
- *A video camera*, so you can add short clips to the screencast. We've included clips of things we've set on fire (we're chemistry teachers, remember?) as well as of the Hope Diamond exhibit at the Smithsonian National Museum of Natural History in Washington, D.C.



Where to Start

- *Plan the lesson*. Determine the lesson objective—and whether it lends itself to video. Use material you already have on hand, such as PowerPoint presentations you typically show in class.
- *Record the video*. You can do this sitting at your computer or standing before an interactive whiteboard. You "teach" the lesson to your absent audience, pausing along the way. Some teachers work with a script. We prefer not to. Students like the conversational qualities of our videos, which feature both of us.
- *Edit the video*. You'll become more fluent at this with practice. With the editing feature, you can correct mistakes (instead of rerecording the entire lecture), add videos, zoom in and out, and so on.
- *Publish the video*. You can publish your videos on an online hosting site (such as Moodle or Blackboard); on internal district servers; and locally on the computers in the classroom. You can also burn DVDs.



Authors' note: A more detailed description of how to create screencasts appears in *Flip Your Classroom: Reach Every Student in Every Class Every Day* by Jonathan Bergmann and Aaron Sams, 2012, Washington, DC: ISTE; and Alexandria, VA: ASCD.

(IEP) and needs extra time to process what he's learning. His IEP states that he should have extra time on exams, sit toward the front of the classroom, and have modified tests. The flipped learning model has made it easy to provide these accommodations. The student can watch lessons multiple times until he comprehends them, and he likes the fact that he can pause and rewind his teacher! Because Jon is able to talk to every student in every class every day, he can give this student the individual attention and differentiation he needs.

Allison is a Spanish teacher in a school that offers world languages starting in 2nd grade. Her 7th grade Spanish class is made up of three groups of students: those who have been at her school since kindergarten and who are almost fluent in Spanish, those who have taken Spanish for several years but who struggle with language acquisition, and those new to Spanish who have just transferred in.

By implementing flipped-mastery learning, Allison can now effectively teach all three groups at the same time, differentiating for learners according to their level of fluency. She moves around the room visiting each group, providing students with instruction as they need it, when they need it, and at the appropriate level. Some students may be viewing a lesson, some may be conversing in the language, and some may be completing grammar lessons, while others are taking assessments in the class's learning management system.

Getting Started

The term *flipped classroom* implies that a teacher is recording all lectures or direct instruction for students to view outside class. This across-the-board approach is neither necessary nor beneficial. Terms like *flipped lessons*, *flipped learning*, or *flipped thinking* more clearly

convey what "flipping" actually means. A teacher must carefully consider which lessons lend themselves to time-shifting direct instruction out of class—and which do not. A selective use of video where appropriate will provide students

teachers the flexibility to meet the learning needs of all their students, and it gives students the flexibility to have their needs met in multiple ways. By doing so, it creates a classroom that is truly student-centered. 

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with a better learning experience than a blanket use of video when video is not the right tool.

It took us a while to develop this approach. We didn't do it in a year, and we refined things along the way. A simple way to begin is to record all your live direct instruction lessons for one year. All you need is a video camera. By the end of the year, you'll have a library of videos to make available to students. You could also consider flipping one lesson—or one unit of study—each term. As you add on to the videos, you can begin exploring new ways to use them as instructional tools, or you may reconsider how you record your lectures, perhaps deciding like we did that screencasts are the better option.

If you're truly overwhelmed by the idea of creating videos, you can use videos that other teachers have created, search for good ones online, or pair up with a teacher to do a video together in a conversational format.

Learning at the Center

Education is for everyone, but the way we deliver education—and the way students receive it—is not the same for everyone. A flipped classroom gives

Authors' note: Several concepts in this article appeared in a presentation given for Jurgen Handke, professor of English and Computational Linguistics at the University of Marburg, Germany.

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