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Inverted Classroom

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FEATURE

Inverted Classroom

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The typical university classroom allocates time in a way that is familiar to everybody: Students gather at the class meetings to hear a lecture from the professor and to take notes, and then students work on homework, projects, and other activities outside of class. The traditional classroom is so familiar, in fact, that it can be difficult to conceive of classes being run any other way—and difficult to think of why anyone would ever want to.

But there is reason to believe that this time-honored setup is not best for student learning. The most difficult tasks students have to perform generally appear on the work they do outside of class, on their own and separated from the instructor's help. Conversely, the instructor's availability is at its maximum in class, but this is when the cognitive tasks for students are at their lowest level and when students need the least help. It would almost seem that a reversal of the traditional setup would be an improvement: Have students acquire basic information through lectures, reading, and other sources outside of class, and put them to work on challenging, high-level cognitive tasks during class.

That reversal is at the heart of what is known as the inverted classroom. In the inverted classroom, lecture and homework switch places, with lectures taking place outside of class through prerecorded video and class time, in its place, being spent on active work. With lectures being consumed outside of class, students can pause to reflect on what is being said, rewind to hear it again, listen to as much or as little of the lecture as their schedules permit, and view the lecture on a mobile device rather than in a fixed location. And in class, students can focus on internalizing the material with the direct help of their peers and their instructor. Since instructors do not present a one-size-fits-all lecture to an entire class, instruction can be personalized to each student, and the instructor can take the role of a "guide on the side" role rather than a "sage on the stage". The end result can be a classroom that is more inclusive, more active, and more learner-centered than the traditional classroom.

The term "inverted classroom" was coined by a group of economics professors at Miami University (Ohio) to describe their use of the technique (Lage, Platt, & Treglia, 2000). The method itself has roots in the case study approach used by business and law schools, and the humanities disciplines can argue that they have used this method for centuries when students are given reading assignments to complete outside of class to prepare for an in-class discussion. In the K-12 education community, the inverted classroom is often known as the "flipped" classroom and has shown increasing interest stemming from the work of Colorado science teachers Jonathan Bergmann and Aaron Sams. In recent months, the inverted classroom has attained an increasingly high profile among educators; Bermann and Sams' inverted classroom professional network (University of Northern Colorado) currently has over 3000 participants, for instance.

But does the inverted classroom actually help students learn more effectively than a traditional class structure?

Recent evidence suggests that it does:

- At the University of California at Irvine, traditional large-lecture introductory biology classes were switched to an inverted classroom format. Students in the inverted classroom format showed an average increase of 21% on exam questions that were formerly covered in lecture but moved to pre-recorded videos watched outside of class and followed up by interactive exercises. (Moravec, Williams, Aguilar-Roca, O'Dowd, 2010)
- At Miami University (Ohio), students in a software engineering course designed using the inverted classroom format showed strong self-ratings of their abilities to write application software and high levels of engagement. (Gannod, Burge, & Helmick, 2008)
- At Franklin College (Indiana), in a linear algebra course taught by the author, students were given a choice of solution techniques to use on a final exam problem, one introduced in a traditional lecture and the other in a prerecorded video, and both rehearsed in class through group work. Students employing the solution technique from the video had a significantly higher success rate on the exam problem than those using the one from the in-class lecture. (Talbert) And in an inverted-classroom introductory scientific computing course also taught by the author, students attained a high level of work even though their computing backgrounds entering the course were minimal, and they showed a strong ability to acquire technical skills on their own one semester later. (Talbert)

The profusion of cheap, simple, and accessible technology for recording and sharing video online has made the inverted classroom easier than ever to implement. Instructors can simply set up a video camera to record their lectures at the board, or they can use screencasting software such as Jing or Camtasia to record actions on their computer screens. Those videos can be uploaded to online hosting services such as YouTube or Screencast.com for viewing by students. Although it may sound daunting to some, the technology is easy to learn and often entails no financial cost. (For example, Jing and YouTube are both free.)

The inverted classroom does have potential pitfalls. The creation of video content can be time-consuming. Students can often feel that they are being abandoned to learn the material on their own, which is a legitimate concern if the instructor does not actively engage students during the in-class time. Also, students who come from an educational background where lecturing and rote work is the norm may experience a great deal of culture shock at the inverted classroom and resist taking on the responsibility for learning that the method entails. Instructors should be prepared to gather lots of formative assessment data to watch for places where students may not be learning and to convince students that they are learning when appropriate.

Despite these potential issues, the inverted classroom shows promise for making university classrooms more interactive, inclusive, and effective for all learners. Given the nature of the way modern students learn and the technology available to help them learn, the time may be right to move past the traditional classroom structure to which we've grown accustomed and give the inverted classroom a try.

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