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## Why An Active-Learning Evangelist Is [after the pandemic] Sold on Online Teaching

Eric Mazur is something of a teaching celebrity. A professor of physics and applied physics at Harvard University, he has been preaching about the value of active learning for decades. His two-semester course in applied physics, an introductory class designed for non-majors, is built around project-based learning, group work, and peer-to-peer instruction. He is, in short, a seasoned expert on effective teaching strategies.

Still, Mazur was just as surprised as anyone when the pandemic hit and he had to scramble to move his course online for the remainder of the spring-2020 semester. And, like so many others, he took time over the summer to redesign his course for a fully remote experience once Harvard decided to remain online.

Rather than just move what he usually did online, he decided to take advantage of the new format. That meant making changes including minimizing synchronous and instructor-paced activities.

Now, says Mazur, the results are in and he's convinced: online teaching is better. Not in all circumstances, to be sure. But in his applied-physics courses, students showed larger learning gains and felt more supported than students had in in-person classes. In fact, they appear to have learned so much more effectively in this new format that he wonders if it's "almost unethical," to return to the classroom this fall.

"I have never been able to offer a course of the quality that I'm offering now," he says. "I am convinced that there is no way I could do anything close to what I'm doing in person. Online teaching is better than in person."

Given how fraught active learning can be — students often rebel against group work, and professors can struggle to ensure that students are prepared for class — what did Mazur do that made his course function so well?

To find out, I observed two classes last month.

The first thing to know is that Mazur leaves very little to chance. His courses have long been highly structured, with students expected to complete dozens of low-stakes assignments over the course of the semester, which works out to several per week. They are also given several opportunities to redo their work if needed. Peer pressure is another motivator to stay on track, as group work requires members to function effectively together.

One benefit of this setup, says Mazur, is that students go at their own pace. He has thought a lot about how classroom-based work, even when it is student-led, is hostage to the clock and the instructor. Not every student works at the same pace, yet everyone has to wait until others are ready, or rush ahead when they fall behind. When students set their own pace, it gives them the space to work through problems or get help as needed.

“I have never seen students work this hard for my course,” he says. “Never. And so consistently.”

Mazur says he designed all of the class activities to match his learning goals, which include self-directed learning, content mastery, teamwork, and professionalism. (To learn more about how he structures his course, including assessment and team work, visit his course Canvas page.) The only part of the course Mazur felt suffered was the lack of collaborative, hands-on work, normally done in the campus maker space, and the inability to run a project fair.

At the end of each semester, Mazur asked students to evaluate the course and him as an instructor. On both measures, scores came in higher this year. Using pre- and post-tests, he also saw greater learning gains and an increase in self-efficacy, compared with students in his prior in-person classes.

He also asked students how challenged and how supported they felt. They felt as challenged as students had in earlier face-to-face classes but far more supported.

Similarly, this year's students expressed a greater sense of growth, autonomy, and community in the online course than students did in previous in-person classes.

Mazur is still analyzing what this all means and what elements of the course design were particularly effective.

None of this has been easy, of course. As Mazur put it, he spent a “monstrous amount of time” putting the course together this year. But he's so convinced of how valuable this model is that he asked Harvard to allow him to keep teaching online this fall.