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Psychology

Are students learning as much as they think they are? The dangers of fluent lectures

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ABSTRACT

We have all experienced amazing teachers who lecture clearly and smoothly. Even if we are just listening and taking notes, it feels like we learn a lot from these superstar lecturers. But a Harvard study finds that this "feeling of learning" can be deceptive. Students will learn more if they are actively engaged in the classroom, even though they might feel like they are learning less.

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Think back to a college or high school classroom in a STEM subject (Science, Technology, Engineering, or Math). Your teacher probably talked most of the time, perhaps using the blackboard, a projector, or demonstrations to illustrate specific points. You mostly took notes and occasionally asked questions. As a student, the classroom was most likely a passive experience.

Not surprisingly, there are better ways to teach and learn science. Many of these new approaches are broadly described as *active learning*. In an active classroom, students engage productively with the course material through in-class activities and discussion. Decades of research have shown that students learn more with active learning than with passive lectures.

Yet most teachers still lecture, and students often prefer good lectures to active learning. One study found that a third of college teachers who try active learning, end up switching back to lectures, in part due to resistance from students. If active learning is genuinely superior, why have students and faculty been so slow to embrace it?

Our study sought to understand this apparent paradox. We had heard students complain that they didn't learn as much in an active classroom, despite all the research showing otherwise. We decided to take them at their word: perhaps students honestly

felt like they learned less with active learning, even though they actually learned more.

We designed the study as a randomized controlled trial. Students in a physics course were randomly split into two groups (A and B) and sent to two different classrooms for one class period. Group A was taught using active learning, while Group B got a passive lecture. For the next class, on a different topic, the roles were reversed: Group A got a passive lecture while Group B had active learning. The study was repeated in the same course the following semester.

At the end of each class, students assessed their "feeling of learning" by rating how much they agreed with statements like, "I feel like I learned a great deal from this lecture" or "I wish all my physics courses were taught this way." Then they took a multiple-choice test to see if they had actually learned the most important concepts from the class.

As expected, in each case, students in the active classroom scored significantly higher on the test of learning. But their feeling of learning was substantially lower than that of their peers who sat through a passive lecture.

We kept the experiences of the two groups as similar as possible: the only difference was the amount of active engagement with the material. Indeed, both groups used *identical* paper handouts with about six problem-solving activities (appropriate for a one-hour class).

In the active classroom, students first tried to solve the problems by working in small groups for about five minutes while the teacher walked around the room and answered questions. Then the teacher explained the correct solution for about five minutes. Each explanation focused on areas where students had struggled during the activity. These cycles repeated throughout the hour.

In the passive lecture, the teacher presented the same solution to each activity but spent the full ten minutes explaining how to solve the problems clearly and smoothly. These smooth explanations made students feel like they were learning a lot, but they never had to struggle and attempt to solve the problems.

Why might students feel like they learn less in an active classroom when, in fact, they are learning more? First, a well-known result in psychology, the Dunning-Kruger effect, finds that novices in a subject are poor at assessing their own abilities. Students often make incorrect judgments about their learning. Second, when information is presented with great clarity, impeccable organization, and smooth flow, listeners can be misled into thinking that they are learning, when, in fact, they are not. Psychologists find that we often rely on this misleading sense of "fluency" when judging cognitive tasks.

How should we respond to these findings? If you are a teacher, use active learning, but be sure to "sell it" to your students. Tell them that their cognitive struggle is a sign of deep learning. If you are a student, realize that learning is hard work—you are physically re-wiring your brain—and seek opportunities that foster this kind of effort. And we all should insist that our schools and colleges adopt proven strategies such as active learning. After all, when we visit the doctor, we want a treatment that will actually cure our disease, not one that just makes us feel like we are being cured.