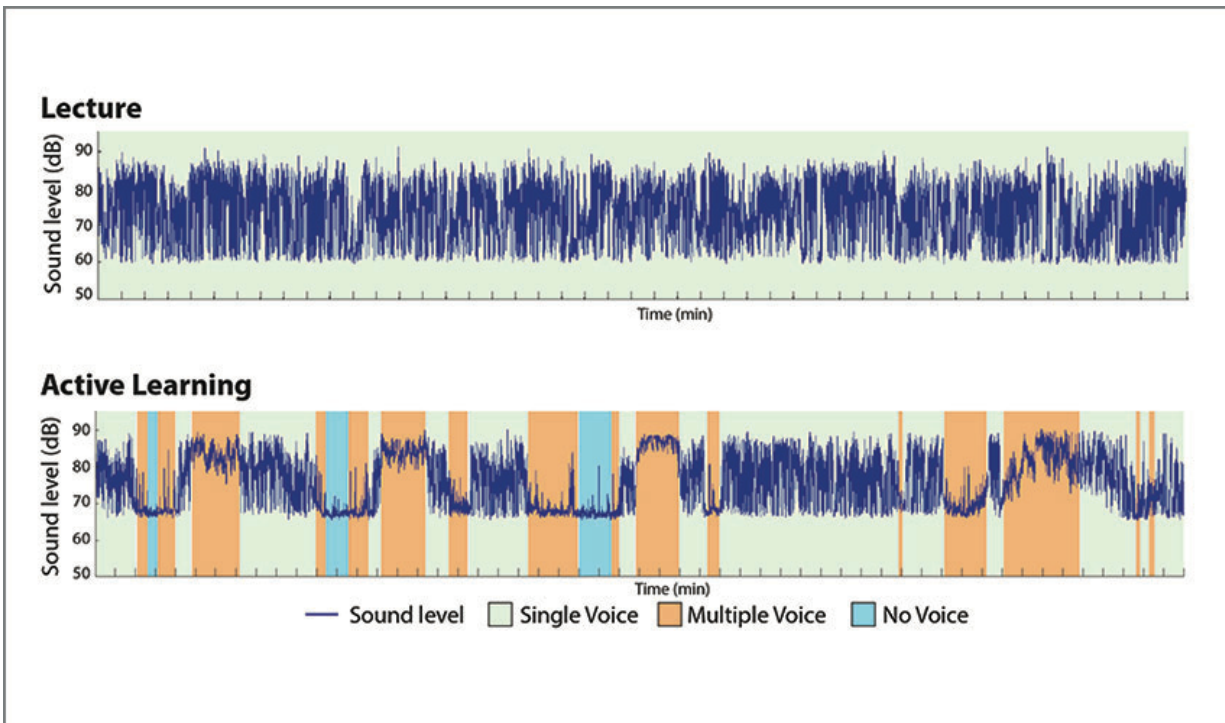


# Researchers create new tool that measures active learning in classrooms

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San Francisco State University researchers used an optimized computer program to classify sound into three categories in classroom audio recordings. Credit: San Francisco State University

Researchers at San Francisco State University have developed a tool that for the first time can measure the extent to which instructors use innovative teaching methods by analyzing simple audio recordings of

classroom sounds, according to a study published today in the *Proceedings of the National Academy of Science*.

Researchers analyzed recordings of more than 1,486 sessions from 67 different courses using the tool, dubbed DART—decibel analysis for research in teaching.

"The breakthrough here is that for the first time we can effectively and inexpensively measure the use of innovative teaching strategies that have previously been shown to produce better learning than lecture only," said SF State Professor of Biology Kimberly Tanner, principal investigator on the study. Tanner's research focuses on novel teaching strategies.

"In my work, I've found that many [faculty members](#) want to improve their teaching, but they don't have the tools to help them see how they're doing," said Tanner. "It's like trying to lose weight without a scale—you can't improve what you can't measure. DART provides a simple, easy way to answer the question 'How much of class time do I devote to engaging my students in active learning?'"

The findings are based on a comprehensive SF State project that includes 83 community college and university instructors involved in examining and promoting innovative teaching methods.

Tanner says DART can be used in any classroom, and at this time it's free and can be accessed online at <http://dart.sfsu.edu/>. SF State researchers have secured a provisional patent for the technology and eventually plan to create an app.

According to Tanner, traditional teaching often focuses on a lecture that's delivered by a faculty member to a group of students. Modern educational research has shown that active learning—a term used to describe a variety of related methods where students interact with each

other and engage in problem-solving activities ? drives stronger learning and better educational outcomes than lecture alone.

But widespread adoption of innovative teaching methods that foster increased learning has been slowed by the lack of a way to quantify how much they are really being used by instructors, Tanner said. For example, faculty members can overestimate how often they truly engage students. In addition, educational reform leaders and funding agencies do not currently have easy and efficient ways of monitoring if teaching changes are happening in real-world courses.

As part of the SF State research project, faculty members affiliated with 22 colleges and universities recorded their classes, which ranged in size from 4 to 300 students, using standard audio recorders. At the same time, trained evaluators took notes about what happened in the classes and identified the various instructional methods used, including faculty lecture, small-group discussions and quiet problem solving.

Researchers then used an optimized computer program to classify sound in the audio recordings. Using only the classroom sounds, DART could classify the audio into three categories—single voice (traditional lecture with question and answer), multiple voice (student interactive group work), or no voice (student thinking, writing or individual problem solving)—with over 90 percent accuracy, which matched the ability of the human evaluators to correctly classify the classroom environment. It wasn't necessary for DART to classify the actual content of the recorded speech, so student and instructor privacy was protected. DART could do its work based solely on the overall level and type of noise in the classroom.

"Although the initial research focused on biology classes, the DART method can be applied in almost any teaching situation," said Melinda Owens, postdoctoral scholar and lecturer at SF State, one of three lead

authors on the paper. "Just like a person can track their progress toward their daily steps with a fitness tracker, a faculty member could track their progress toward adopting [active learning](#) with the DART system."

"DART looks like a great new tool for solving the biggest outstanding question in undergraduate science education ? namely, what teaching methods are actually being used in college classrooms, and how can we routinely monitor those. Before this work, it appeared impossible to answer these critical questions," said Nobel Prize-winning physicist and physics education researcher Carl Wieman of Stanford University. "This work now shows how to do that quite easily. I am surprised that this method is so effective at characterizing the [teaching](#) taking place, but the massive scale of the analysis and the care in which it was carried out are very convincing."

**More information:** Classroom sound can be used to classify teaching practices in college science courses, *PNAS* (2017). [DOI: 10.1073/pnas.1618693114](#)

Provided by San Francisco State University

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