PRIORITIZING THE NEED TO LEARN PHYSICS IN **REAL TIME** THROUGH **ACTIVE LEARNING**

"IT'S NOT REALLY WHAT I'M ASKING THAT MATTERS, BUT WHETHER STUDENTS ARE LEARNING IN REAL TIME."

Matt Evans, Professor of Physics and Astronomy at the University of Wisconsin-Eau Claire has been using clickers since 2004. Currently utilized in General Physics and University Physics, Professor Evans has vetted his best practices in both large lectures and more intimate class environments. His primary focus in incorporating clickers is to engage students while they're in the classroom, drive conversation, check in on where students are struggling, and create an environment where students are helping each other to learn.

Begin class with a question

There's always an iClicker question on the board when Professor Evans' students enter class to start the learning as soon as they settle into their seats. The question can vary; sometimes it's related to a pre-reading assignment, and other times it's a question that clues them into what's important from pre-class work. Regardless, the question helps get the students thinking. Professor Evans awards 90% for engaging with the question and an additional 10% if they get the answer right.

The purpose of starting this way is to ensure the whole class is participating. The goal is 100% participation. Rather than asking students to raise their hand in response to a verbal question, where you may only get feedback from those few vocal students, the goal is to get everyone's opinion each time a question is directed to the class.

Because participation is the purpose of the question, Professor Evans doesn't leave his students in suspense. When time to respond runs out, he has the right answer—along with an explanation—ready to share. Setting a time limit for questions prompts students who aren't fully ready to respond to select an answer in time to be part of the class discussion.

The benefits, gleaned so far from this strategy include:

- Showing students their voice not only matters in the classroom, but is necessary
- Helping students learn the material
- Getting students to complete more work in real time so they're able to see what they understand and what they may need to revisit

Peer discussion as an essential element to active learning

Past experience has shown Professor Evans that a higher level of understanding results when one person gets to help another understand what's going on. Translating this into his classes, a think-pair-share strategy is employed to help the "learner" comprehend concepts while reinforcing them with the "teacher" through the process of:

- Posting a question
- Giving students time to think independently about the right answer
- Conversing with a neighbor to compare answer choices, with time to modify their selection if necessary

> **"Questions should be challenging, you should only want about 1/2 to 2/3 of your students answering correctly before having to work with a peer."**

Responses coming in from the students prior to the peer-to-peer collaboration are reviewed in real time where Professor Evans may provide them with a clue to ensure the majority of students are on the right track. He doesn't share the actual results, because students are, "much more likely to work to get it right if they're doing peer instruction than if you just tell them the answer."

This strategy helps introduce tough topics to the class and allows learning to be more efficient, all while giving students the opportunity to learn from their peers. It also extends the capabilities of the classroom beyond that of a traditional lecture.