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## CU program measures learning click by click

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University of Colorado students actually are learning things in class, and researchers have the data, the evidence and the clickers to prove it.

Clickers are a way for professors to determine whether a concept they just taught is understood.

How many think the correct answer is A? B? C?

Students press a button on their clickers to record their choices, and the results appear immediately on the prof's laptop in the front of the classroom.

But the worry always has been that students simply go along with what the smart student sitting nearby thinks.

So, seven CU-Boulder researchers collaborated on a better way to measure student learning. Their results appear in this week's issue of *Science* magazine.

Michelle Smith, with CU's Science Education Initiative, uses the clicker system in her genetics biology class of 360 students.

First step is to see how the students fare at coming up with the right answer on their own.

So, she'll put on the chalkboard a family tree or pedigree, then present an obscure disease:

Q. Charcot-Marie-Tooth syndrome, a disorder hitting one out of 2,500 people, that causes nerve damage and is characterized by slow progressive degeneration of the muscles of the foot, lower leg, hand and forearm.

Which of these modes of inheritance would not be responsible for this syndrome?

- A. X chromosome dominant
- B. X chromosome recessive
- C. Autosomal dominant
- D. Autosomal recessive

Students record their choices, then they're asked to discuss it with their neighbors for a few minutes.

Inevitably, one answer emerges as most popular, and it's usually the right answer — the power of group discussion wins out.

But are most of the students simply going along with the one deemed smartest, or the one who did most of the reading?

So, Smith gives a follow-up question, which must be answered without the benefit of group discussion.

"We'll put up a different family tree" a different disease and make the modes of inheritance look a little different.

The correct answer this time is going to be different than the previous correct answer.

Have they learned not just to memorize an answer, but to apply their knowledge to a different set of circumstances and come up with a different conclusion?

"And we find that they are learning, that's the exciting part," Smith said.

"A lot of my students are in pre-med, they're going to end up being doctors," she said.

"We don't require them to just memorize that this disease is inherited in this way. Instead, we want them to take the information, decide what is relevant and make the right choice."

Collectively, the CU researchers have found that:

-- students get the correct answer to the first question, on their own, 50 percent of the time.

-- after a group discussion, the correct answer is chosen 68 percent of the time.

-- the follow-up question elicits the correct answer 70 percent of the time. The students actually fare better on their own this time around than they did when they were relying on the wisdom of the whole group.

"The important point is that none of the students were told what the right answer was," said Tin Tin Su, an associate professor of biology.

CU's Science Education Initiative and is unique in its scale and focus among the nation's universities, says Smith.

It's focus os to implement new approaches to teaching that have research to back up their effectiveness.

The clicker initiative is being used in most of the large science classes at CU-Boulder.

Students "love the clickers," dubbed iClickers, and 17,000 have them, Smith said. The clickers are required in 135 courses.

"They like the break in lectures, the chance to solve problems," Smith added.

A lot of professors like them, too, she said. "They're rethinking how they structure their lectures.

"Instead of just fact after fact, what should be students be able to do? To be able to solve?

"It's a win-win situation."

The clickers have been proven useful in classes from physics to history, psychology to gender studies.

CU's Information Technology division began supporting the iClicker in 2007. They cost \$40, but if they're not lost, they can be used throughout a student's four- or five-year undergraduate education.

"A physics major is going to use the iClicker in 15 courses in his or her career," said Mike Dubson, associate chairman of physics. "That's not much of a financial burden."

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peter303 writes:

Its called "active learning" (the lowest form) in keeping students' attention at lectures diverted from doodling, sleeping, or browsing Facebook. Also it gives both students and teacher immediate feedback how a piece is going. Several studies say it improves learning.

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