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Hey Higher Ed, Why Not Focus On Teaching?

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Illustrated portrait of Nobel Laureate, Carl Wieman

LA Johnson/NPR

Stanford physics and education professor Carl Wieman won a Nobel Prize for his innovative, break-through work in quantum mechanics. Wieman has since levered the prestige and power of that prize to call attention to the need to transform undergraduate teaching, especially science education.

Wieman's message, as we've reported here and here, is bold: Too many undergraduate programs fail to focus on teaching effectiveness or even bother to try to measure it. As he sees it, undergraduate Higher Ed still worships at the old false idol called the Big Lecture and doesn't seem to want to ask whether it's working.

His solution: Systemically improve teaching through methods that have become known as active learning. Wieman's been interested in effective teaching strategies for years. He argues that a well implemented active learning approach can substantially improve understanding and retention of the material and boost attendance and course satisfaction, among other improvements. His new book is *Improving How Universities Teach Science: Lessons from the Science Education Initiative*. I recently spoke with him about the book while hosting the show Forum on NPR Member Station KQED. Here are the highlights:

You argue that the well-established, traditional, large lecture format still used widely today across higher education is ineffectual. Why?

People doing research in this area, like myself, we measure (learning) and we just see that the learning that takes place is really minimal, and then if you dig into the way the brain processes and learns, it's pretty clear why it's so minimal. To learn something, you really have to be processing those ideas. I think of it as sort of exercising the neurons in the brain. Sitting there listening to someone — where it's just flowing past you — you're not doing that mental processing. You're not exercising the brain and you walk out without really learning anything.

In one case study we did, we had students go to these lectures, and then we gave them a pop quiz right at the start of the next class. We saw their score on this quiz was about 10 percent. In other cases, where people have looked at long-term retention, where you measure something a few weeks later, they see a very rapid drop off. Even if

students can score high on a final exam, three weeks later, it will be down dramatically. It's sort of a very brief learning that goes away quickly.

You just have to measure the results and you see that tradition doesn't always mean that something is right.

You write in your new book: "It's next to impossible for prospective students to get any meaningful information on the quality of teaching at the institutions they're considering." It's the job of universities to teach. You're saying they don't really bother to measure how well they're doing?

What they (colleges and universities) measure are student evaluations at the end of the course, and if you dig into this, that's overwhelmingly dominated by personal appearance and characteristics and size, of course. It's not really connected to how much the students are learning. It's not at all connected to whether the instructor is using these practices that we know are more effective at learning.

Why aren't universities doing more to measure effective teaching? Is it the way the Higher Ed system has been set up?

It's a system that grew haphazardly. Really it grew before the printing press was invented, and the structures — like the lecture — were how to transmit information to people who didn't have books. Universities are a little slow to change. The printing press came along, and we're still adjusting to it.

There's a big range of colleges, but you look at the big research universities. They have very detailed, careful systems for measuring research and rewarding it, and they don't have anything like that for teaching. The incentive system has just gotten completely warped to research productivity. People just need to start recognizing there are more effective ways of teaching. There are ways to measure that — that's a research result that we have over the last couple decades and it needs to come into how our system works.

You write about the Science Education Initiative and trying to improve undergraduate teaching through active learning techniques. How is that

instruction in the classroom different from the big lectures?

Research-based, active learning is about teaching the thinking that you really want students to learn. How does a physicist think about a problem, or a chemist, and so on, and what decisions do they make, and then you break that problem down into student, bite-sized pieces. You give them to the students to work on. They usually work in small groups. The instructor is monitoring how the students are thinking. What's right, what's wrong. And then will periodically pull them back together every five or 10 minutes to discuss how they are coming along. Give them feedback on what thinking is right or wrong, so it's very much a process of practicing the thinking and getting feedback on it. Just like if you wanted to learn to play a sport, that's exactly what we'd do.

The other thing these teachers are doing — that a coach also does — is they break down performance in a field into the right kind of practice exercises. Dribbling with your left hand, and focus on mastering that, and then putting it together in the same way. Very much like a coach.

[Note: The Science Education Initiative was implemented across thirteen science departments at the universities of Colorado Boulder and British Columbia. The data show that in the most successful departments 90 percent of faculty adopted better teaching methods]

Are the active learning teaching techniques applicable as well to the humanities, among those teaching Shakespeare or art history, or for that matter, a K-12 classroom?

That gets to be a more complicated issue, and I would argue on the basis of the research on learning that they almost certainly apply to most of the humanities because you can identify a historian ... How they think about things, how they evaluate sources, etc. They have very much clear, expert decision making processes, and we have that. We know how to teach those better, but we don't have people in those fields who have tried them in the classroom.

We have data on the fundamental learning processes, but I can't claim to a history course like I can physics, and say, 'this class learned this way, that class learned that way,' and see, they learned twice as much in this class.

We do have some research from K-12, and the basic ideas certainly apply down to quite low grade levels. It gets more complicated because there's a lot of other factors that come into a K-12 classroom, as you know, that affect what students are doing and thinking and learning, so that makes the implementation tricky.

The other thing that makes it quite tricky is that these methods really require a greater level of expertise in the teacher. They have to understand the subject at a deeper level to teach it effectively with these methods. A lot of our K-12 teachers didn't come out of college with that depth of knowledge of the science they're supposed to be teaching.

How are screens and multiple digital devices affecting learning in the classroom, and do you think education and teaching might be different for this millennial generation?

These new technologies can be helpful, but generally they are bad in that they distract people. One of the things that's very easy to demonstrate in studying learning is a distraction. Splitting your attention between two things. Your brain processes this stuff in very different ways, and the amount of learning drops precipitously. Basically, when those kids are in that classroom and they are switching their attention back and forth between their cell phones and the internet and what's happening in the classroom, I can just guarantee the learning, as it turns out, is almost zero as soon as that happens.

Are university presidents and provosts and key administrators listening to you, and reading these kinds of books to look at improving teaching?

Not much. I'm always struck by when I talk with administrators. I get lots of requests to go speak at places, and I have the requirement that if I'm going to come, they've got to make sure I get to talk to the president or provost just to add a little push. I'm always struck by how little awareness they have that there really are measurements of

different ways to teach and what's effective and not effective. It's certainly not in the qualification to run a university to know anything about learning, unfortunately.

Ultimately, I think our society cares about what students are learning. It's just about good management to make sure people are really looking at what they are learning and best supporting their learning.

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