Carl Wieman says better teacher can attract students to science

JOHN ROSS  THE AUSTRALIAN  MARCH 9, 2016 12:00AM

Nobel laureate and Stanford professor Carl Wieman, pictured at the University of Queensland, says methods of instruction must evolve. Picture: Lyndon Mechielsen.

Sliding science enrolments can be blamed on unscientific teaching methods, a visiting physics legend says.

Nobel physics laureate Carl Wieman says science education is trapped in the Middle Ages.

“The teaching is medieval in the sense that it’s somebody standing up there dispensing information,” he says.

“After the invention of the printing press that (approach) became somewhat obsolete.

“Until very recently we didn’t have the data showing that there were better ways to do it, but now we do.”

Wieman shared the 2001 Nobel Prize in Physics for discovering a state of matter known as the Bose-Einstein condensate.
This week he is on a whirlwind tour including the University of Queensland, the Universities Australia conference and the University of Sydney. His message is that educators need to measure and evaluate their methods.

He underscores the point with a health analogy. “If you know patients die because doctors don’t wash their hands, the first thing you do is monitor whether doctors are washing their hands.”

The other message is that students need to be taught to think like scientists. “You have to have the brain of the student practising certain kinds of thinking.

“If you want to learn to play basketball, I can lecture you all day and you’re not going to improve. You have to practise and get feedback to adapt your motion. Thinking is much the same — the brain wiring changes in response to intense thinking. You’ve got to have those neurons doing the right thing, or students aren’t going to learn.”

He says conventional wisdom is that teaching styles must fit the instructors’ personalities. But the limited research on the subject suggests personality does little more than keep students awake.

“You could show them a good movie and they’d be awake, but they still wouldn’t learn physics. It’s not that there are good teachers. There are good teaching methods and there are bad teaching methods.

“Certain methods get the students’ minds to do the kinds of thinking that’s necessary.”

Wieman says tertiary science enrolments in the US would double if universities lifted their game. He says the revolution needs to start in science, because that’s where the data is most compelling. But approaches in other fields may well be as poor, he admits. “Nobody can answer that question because nobody’s collecting the data.”

And while similar techniques would boost science outcomes in schools, the revolution needs to start in universities. “These approaches demand a great deal of expertise in the subject from the teacher,” Wieman says. “We have to fix teaching at the university level first to make sure all those future elementary and middle-school teachers have the understanding they need.”

His own undergraduate days became an experiment in the approaches he now advocates, when he spent six months living in his lab. “I spent all my time there so it seemed silly to be paying for a dorm room,” he says.

“I didn’t understand about learning back then. What I did understand was working in a physics lab and doing real research was so much more rewarding. Looking back, I got lucky. That was what helped me turn into a physicist.”