

Will Professors Teach Differently in 10 Years?

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Unfortunately, my guess is that the answer to this question is a sound “NO”. Despite continuous claims of a revolution in classroom teaching strategies, the advent of massive on-line open courses, and the huge expansion in the use of technological devices (cell phone, computers, tablets, etc), in most higher education institutions (HEIs) around the world traditional lecturing endures. It will probably continue this way for many years to come, because to do otherwise requires a change of paradigm for hundreds of thousands of instructors, HEIs tradition and culture, and every aspect of institutional operation (research grants, hiring and promotion processes, etc).

Of particular concern is the impact of this inertia on the so-called STEM fields (Science, Technology, Engineering and Mathematics), considered fundamental for the sustainable development of any nation. There are extensive data demonstrating a troubling lack of interest in STEM undergraduate study, and only a small fraction of the students enrolled finish a STEM degree. It is too common to have a high failure rate in basic mathematics, physics and chemistry courses, and too easy to blame the poor performance on previous instruction at the basic school levels. Weak prior education is indeed a reality that has resulted in a need for remedial programs at many universities. However, there is a substantial share of responsibility to be allocated to professors, who usually don't accommodate their teaching strategy to address the needs of the students they are teaching, and who ignore scientific evidence substantiating a clear improvement in student performance when novel methods are employed in the classroom.

A recent meta-analysis investigation of 225 studies showed that the average failure rate of 34% with traditional lecturing decreased to 22% with “active learning”; performance by students on comparable tests improved by about 6% in active learning sections (See S. Freeman et al. PNAS 111, No. 23, p. 8410, 2014). Nobel Prize winner Prof. Carl E. Wieman commented that “this meta-analysis makes a powerful case that any

college or university that is teaching its STEM courses by traditional lectures is providing an inferior education to its students” (C.E. Wieman, PNAS, 111, No. 23, p. 8319). Wieman, comparing this phenomenon to the discovery of antibiotics, also argues that “in undergraduate STEM education, we have the curious situation that, although more effective teaching methods have been overwhelmingly demonstrated, most STEM courses are still taught by lectures – the pedagogical equivalent of bloodletting”. Why is this the case, and why is it so difficult to change?

Faculty members, as any other profession, are driven by a set of incentives, which range from personal achievements (recognition, different levels of influence, etc.) to more philanthropic goals (understanding nature and the universe, solution of a health or social problem, provide a good quality teaching, etc.). There are many parameters that are, or should, be considered in the career development of a professor, which can be roughly separated in terms of research, teaching and services to community. Generally speaking, research has, by far, more weight in faculty evaluation and rewards than the other activities. Besides being easier to evaluate (number of papers, impact factors, etc.), it is usually the most visible aspect of academic scholarship and performance. It takes a long time and effort to prepare a good lesson for an undergraduate course, especially if one has to develop new teaching strategies by designing an active class session. It is both easier and quicker to turn to the yellowed notes of past lectures or to a Powerpoint presentation that took a long time to prepare some years ago. Furthermore, many professors do not recognize the necessity for change in their classroom. They simply keep teaching the way they learned, without necessity or justification to change their approach. The universities must not only reward and promote innovations in the teaching methodologies, but must also provide teacher development programs, in order to cultivate and support new educational approaches.

Inevitably, this will change slowly, if it happens at all. This is a critical challenge for the next decade. Let the revolution start!

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