

Introduction to a data-driven, evidence-informed approach to teaching in Science and Engineering

Extract from p. 16, Thinking About Learning and Teaching as a Researcher Would, from *Reaching Students: What Research Says About Effective Instruction in Undergraduate Science and Engineering* by Linda Kober.

A scientific or engineering mindset

Applying findings from research on teaching and learning to improve your instruction involves the same type of thinking you would use to solve a scientific or an engineering problem in your discipline, whether it is studying how fungi adapt to cold temperatures or developing new construction materials from industrial waste. Jo Handelsman, a Yale University biology professor, uses the phrase “scientific teaching” to refer to the process “in which teaching is approached with the same rigor as science at its best” (Handelsman et al., 2004, pp. 521–522).

Paula Heron, a physics professor and education scholar at the University of Washington, describes it as “both brilliant and obvious to take the perspective of an experimental scientist and apply it to teaching and learning in the discipline.”

Others see similarities between instructional redesign and engineering design, in that both seek to improve complex systems (such as human learning) within the constraints of available resources. In both endeavors, write Purdue University engineering professors Ruth Streveler, Karl Smith, and Mary Pilotte (2012), “we start with requirements or specifications, emphasize metrics, and then prepare prototypes that meet the requirements” (p. 1).

In 2003, Beth Simon was in her second year as a professor in computer science at the University of San Diego when she “began to think about my teaching with the same sort of brain that I use in doing my computer science research,” she says. “My previous computer science research was in optimization, which is about making computer programs go faster. So I would always wonder, where are the inefficient parts?” When she would create a new lecture, she would wonder, “Did that go better than the old one? How would I know? How would I measure it? How can I figure out if I’m producing a better, more efficient, and optimal learning experience for students?”