

# An Introduction to Evidence-Based Undergraduate STEM Teaching

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## Course 2: Advancing Learning Through Evidence-Based STEM Teaching

### Advancing Learning through Evidence-Based STEM Teaching

This course will be offered starting summer 2016. This eight-week course prepares science, technology, engineering, and mathematics (STEM) instructors to develop and implement teaching practices that advance the learning experiences and outcomes of both students and teachers.

#### *About the Course*

This course will provide graduate students and post-doctoral fellows in the STEM disciplines (science, technology, engineering, and mathematics) who are planning college and university faculty careers with an introduction to “teaching as research”—the deliberate, systematic, and reflective use of research methods to develop and implement teaching practices that advance the learning experiences and outcomes of both students and teachers. Participants will learn about effective teaching strategies and the research that supports them, and they will learn how to collect, analyze, and act upon their own evidence of student learning.

The course will draw on the expertise of experienced STEM faculty, educational researchers, and staff from university teaching centers, many of them affiliated with the [Center for the Integration of Research, Teaching, and Learning \(CIRTL\)](#), a network of 21 research universities collaborating in the preparation of STEM graduate students and post-docs as future faculty members. The eight-week course will be highly interactive, with many opportunities for peer-to-peer learning. Learning communities are at the heart of CIRTL’s activities, and this open, online course is intended to foster a large, healthy learning community of those interested in undergraduate STEM teaching—including current STEM faculty.

“Advancing Learning through Evidence-Based STEM Teaching” has been developed by faculty, staff, and students at [Vanderbilt University](#), [Michigan State University](#), [Boston University](#), and the [University of Wisconsin-Madison](#). The course is based on work supported by the National Science Foundation under Grant No. 1347605.

#### *Week 1 – Teaching as Research, Part 1*

We start by exploring Teaching as Research, an approach to evidence-based teaching in which instructors collect, analyze, and act upon evidence of learning as they design and facilitate learning experiences for their students.

#### *Week 2 – Learning through Diversity*

As we consider how learning works in our classrooms, we can’t assume all our students think and learn alike. This week, we discuss strategies for teaching inclusively and for leveraging the diversity of perspectives among one’s students as a strength in the classroom.

#### *Week 3 – Cooperative Learning, Peer Instruction*

The evidence is persuasive: active learning instruction fosters more and deeper student learning than traditional lecturing. How can we create active learning environments in our classrooms? This week, we explore two approaches: cooperative learning and peer instruction.

#### *Week 4 – Inquiry-Based Labs, Problem-Based Learning*

This week we continue our discussion of active learning instruction with modules on inquiry-based labs (lab structures and assignments that teach students to think like scientists and engineers) and problem-based learning (focusing student learning through concrete and challenging problems).

*Week 5 – The Flipped Classroom*

How can we make time during class for active learning instruction? That is the question that motivates the idea of the flipped classroom. This week, we'll explore the flipped classroom as a way to make more intentional and effective use of class time—and engage our students in deeper learning.

*Week 6 – Teaching as Research, Part 2*

We return to the topic of Teaching and Research this week, with practical strategies for framing a research question, collecting evidence of student learning, analyzing assessment data, and drawing conclusions that inform future teaching.

*Week 7 – Project Design*

This week you will design a Teaching as Research project you might conduct in the future, one that incorporates principles and practices covered this course.

*Week 8 – Conclusion*

During the final week of the course, you'll provide feedback to your peers on their Teaching as Research project designs and, in turn, receive feedback on your project design.



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