

Pathways to Scientific Teaching
PLB 802 (sect 301)
Fall 2015

Instructor:

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Class Meetings: Tuesday evenings 5:30 – 7:30 PM. Class meetings from Sept 8 – Nov 3, 2015.

Location: PLB 168

Credit: **Graduate students** – 1 credit; Applies to Certification in Teaching College Science program.

Non-credit: **Postdoctoral Fellows** - enroll by contacting ebertmay@msu.edu

Postdocs – will earn a Certificate in Scientific Teaching from the Department of Plant Biology in the College of Natural Science (citable)

Seminar Overview: I invite graduate students and postdoctoral fellows to learn more about developing and implementing state-of-the-art student-centered instructional materials and teaching strategies for both large and small enrollment undergraduate courses. During this seminar, we will use scientific teaching to actively engage participants in evidence-based instructional methods shown to be effective in helping students learn core disciplinary ideas and cross-cutting concepts better than in courses that emphasize the instructor transmitting factual information by lecturing. Importantly, the pathway to ‘scientific teaching’ integrates the biological research model into a teaching approach by using core disciplinary practices desired for all students, such as applying the process of science, using models, reasoning analytically, developing arguments, and working cooperatively. Participants will gain experience in developing materials, instructional methods, and assessments directed at improving and assessing students’ understanding of biology. Participants will identify one or two fundamental scientific concepts underpinning their own research, and develop an instructional module that is suitable for implementation in an introductory biology course and/or in a job interview that requires a seminar on teaching.

Course Format: The seminar meets two hours weekly (see dates above). I encourage you to enroll with a colleague from your lab, although that is not required. The topics in the seminar are intended to promote and build learner-centered student instruction in undergraduate science courses. Participants will practice inquiry-based, active learning throughout the seminar.

Materials:

Handelsman J, Miller S, and Pfund S. 2007. Scientific Teaching. New York, NY. Freeman Inc.

Evaluation: Instructional modules are assessed using criteria developed for the Faculty Institutes for Reforming Scientific Teaching (FIRST IV), an NSF-funded project.

Goals and Impact of Course: Participants will

- Demonstrate how and why to create learner-centered classrooms.
- Practice how to actively engage students in cooperative work and inquiry-based activities in all types of learning environments.
- Construct a unit/module in which objectives, assessments and instruction are aligned and that promote learner-centered instruction for all students during each class meeting.
- Create learning goals and assessments for the course that enable students to demonstrate deep understanding of big ideas and concepts by using science practices (e.g., modeling, arguments).
- Use and evaluate instructional resources, technology and literature.
- Create, analyze and use assessment data to inform and improve instruction.
- Develop a pathway for integrating teaching and research into your profession.

**PLB 802 Pathways to Scientific Teaching
Weekly agenda**

When?	Topics	Driving questions	Readings
1 Sept 8	Establishing a learning community	Who are we? Who are your students? What are your teaching and mentoring philosophies? How do people learn? What does a learner-centered classroom look like and sound like?	Scientific Teaching Chapter: 1 How People Learn (Ch1 - D2L)
2 Sept 15	Effective classroom pedagogy -- evidence-based practices.	What should we teach? What do students need to learn? Big ideas – in our research? How do we use the literature?	Scientific Teaching Chapter 2, 3
3 Sept 22	Course frameworks to – individual lesson/unit	Designing course goals and learning outcomes - what are the big ideas/concepts? Using scientific practices to learn concepts.	Scientific Teaching Chapter 4
4 Sept 29	Assessment of learning	How will you know that students have learned? What evidence will you and your peers accept?	Assessment – TBA
5 Oct 6	Use science practices for assessment	How do we teach and assess with modeling and arguments?	Hoskinson et al. 2013
6 Oct 13	Diversity and inclusive learning environments	How do <u>all</u> students learn? What about motivation? How can you incorporate diversity into your teaching? Into your teaching philosophy?	Smith et al. 2005 TBA
7 Oct 20	Review of lesson/unit	Group peer-review on learning module. Feedback – revise unit.	
8 Oct 27	Let's teach	How do we evaluate teaching? What are the criteria? Peer review and feedback.	
9 Nov 3	Let's teach	Peer review and feedback	