LA-SiGMA

Louisiana Alliance for Simulation-Guided Materials Applications

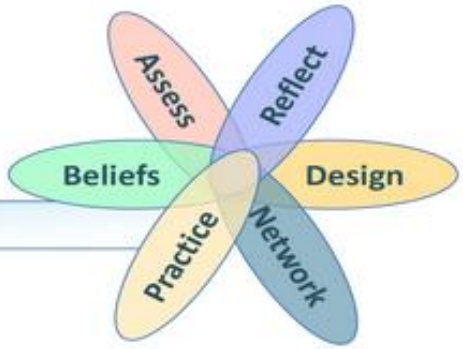
FIRST Training Program on Best Practices in STEM Teaching

Cynthia Sisson and Stephanie Aamodt

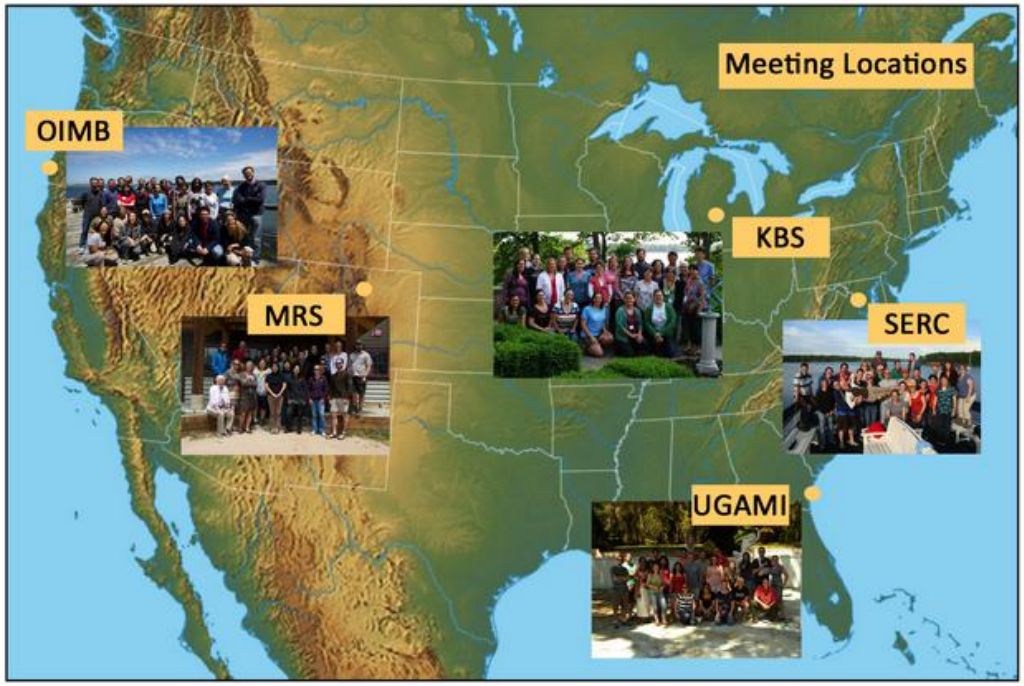
LSU-Shreveport

FIRST IV

Faculty Institutes for Reforming Science Teaching



Transforming undergraduate biology education through postdoctoral scholars



MICHIGAN STATE UNIVERSITY

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Creating an Online Scientific Teaching Institute from FIRST IV

Similarities:

- Early career training in best practices in science teaching
- Scientific Teaching
- Student-centered classrooms

Differences:

- Biology → Physical and Computational Sciences
- 4 day face-to-face workshop → 4 week online course with 4 PolyCom video conference meetings

In this online course, participants will

- **Explore current research** about how students learn and critically evaluate how assessment data provides evidence for student learning.
- **Experience all the components of a student-centered classroom** in the online course and through analysis of videos of teaching in learner-centered vs. teacher-centered classrooms.
- **Learn to actively engage students** in both large and small courses, use individual and group learning strategies, and implement multiple kinds of assessments.
- **Develop a statement of teaching interests and a teaching demonstration** for use in job applications and interviews.

Development of the Workshop

Five units:

1. Introductions
2. What the Research Says
3. What a Student-Centered Course Looks Like
4. Designing using Best Practices
5. Products for the CV

Using videos, screencasts, discussion forums, wikis, and weekly PolyCom video conferences

Cohort 1

- July 5th – July 31st

- 25 Graduate Students and Post-docs

  LSU

  Louisiana Tech

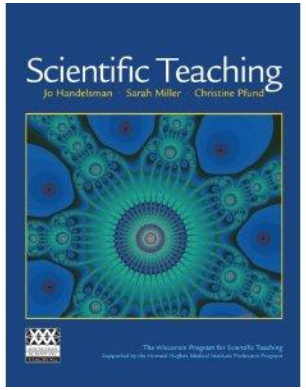
  Southern University

  Xavier University

- Friday video conferences between LSU-Shreveport and all institutions except Xavier

Units 1 & 2:
Introductions / What does the Research Say?

Scientific teaching:
If this were a new research project, what would your first stop be?



How do you know what works: research and data!

Science Education Research

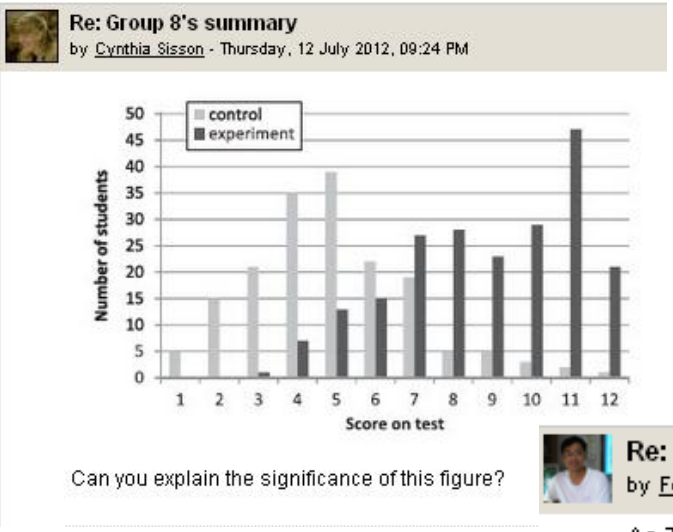


Table 4. Comparison of average performance on different assessments for all three courses

Assessment	Performance (average percent of maximum score)		
	F'03	S'04	S'05
Pretest (12 questions)[a]	34	31	37
posttest (12 questions)[a]	65	74	72
Raw learning gain	31	43	38
Normalized learning gain[b]	46	62	61
Hourly exams	71	71	73
Final exam	77	71	76
Problem sets	82	85	90
Participation	N/A	86	86
Final total points	76	81	81

[a]Data based only on the 12 questions that were common to all three pretests and posttests (see Appendix A).
[b]Average for each class is shown. Normalized learning gains were computed as described in the text and the legend to Figure 2.

1: the results of pretests (34 % -F'03 and 31% - F'04) indicate that incoming students were equally prepared, the average posttest results were significantly higher in the interactive courses (65% vs 74%).

2: there was only slight difference on the average performance on final exam and problems sets. However, because tests were conceptually different, no meaningful comparison on test performance could be made.

3: comparison of normalized learning gains (defined as actual gain divided by the possible gain, i.e. 100×(posttest-pretest)/(100-pretest)) from F'03 and S'04 courses showed a significant 16% difference.

Re: Group 8's summary
by Fei Han - Thursday, 12 July 2012, 11:12 PM

As Table 1 showed, there is no significant difference in the test scores before the experiment. This figure shows that, after the one-week long experiment, the test score in the experimental section is significant higher than that in control section. This figure is taken as a strong evidence of the effect of the highly interactive teaching approach.

Misconceptions

Follow up on the Annenberg Media video by using Google Scholar to find scholarly papers on misconceptions in your major field of study (Engineering, Physics, Chemistry, etc.).

Select one misconception - preferably inthe form of a question - and post it here, along with the reference.

Then, the fun part: using the most naive part of your brain, post your best guess on what students might answer (and why) to at least three of the questions that your classmates have posted. We're not looking for correct answers here, but for the whole spectrum of possible answers and the logic / illogic behind those choices.

Misconception about Energy	NAC	Chinedu Ekuma	7
Which possible direction this object is moving?		Guorong Li	10
Will you change your first choice?		Fei Han	6
Temperature in a Room		Oneka Cummings	4
Just How Good is Density Functional Theory (DFT) ?		Fernando Soto	4

Units 3 & 4:

What a Student-Centered Course Looks Like & Designing using Best Practices

1. What are they learning?
2. How are they learning it?
3. How do you know?

Key Concept or Topic: _____

Course Goals Addressed (from Course Goals table)	**Learning Objectives** 1	**Bloom's LO/HO**	**Type of Assessment that Accomplishes Objective** 2	**Bloom's LO/HO**	**Activity that Accomplishes Objective** 3

1. What are they learning?

- Not what are you teaching, but what are they learning!

- What do you want them to know & be able to do?

If they sit and listen, what they learn to do is sit and listen.

--- Randall Phillis, U. Mass. Amherst

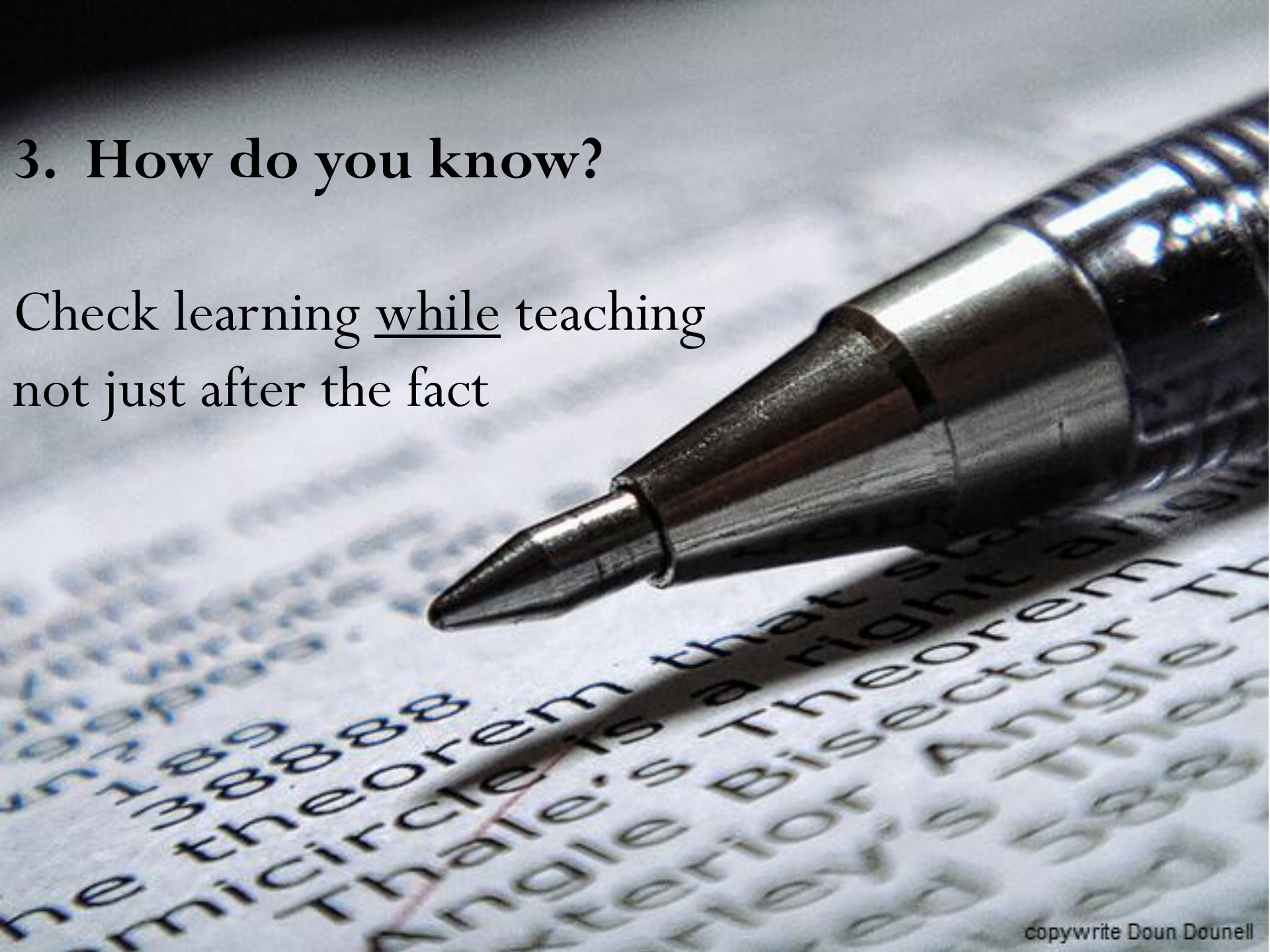
2. How are they learning it?

What is the teacher doing?

What are the students doing?

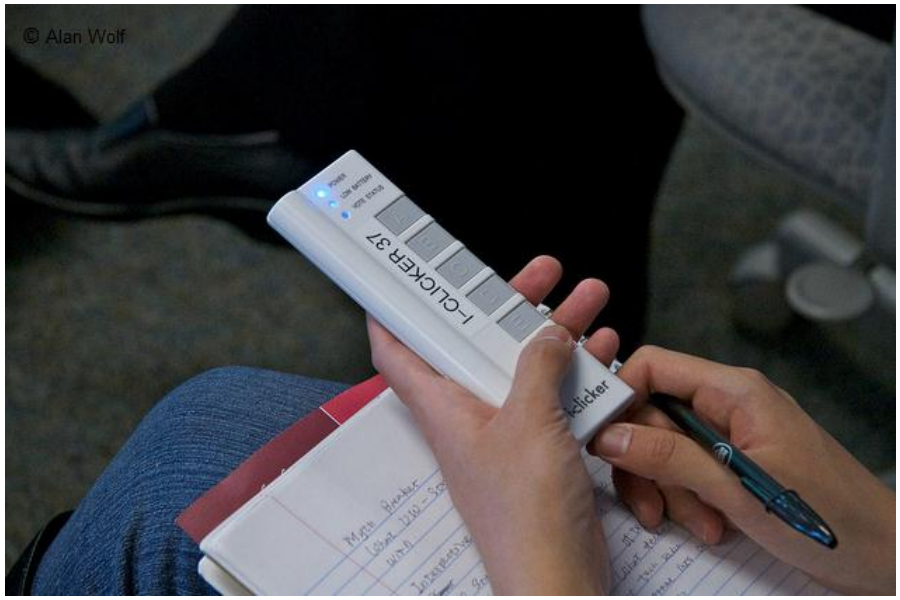
What does an interactive classroom look like?

- Students engage with (and struggle with!) the content themselves
- Students explore, explain, and apply concepts with the help of each other and the professor


3. How do you know?
Check learning while teaching
not just after the fact
copywrite Doun Dounell

Feedback in the classroom:

clickers, whiteboards, and alternatives



Unit 5: Products for the CV

Faculty Opening - Physics Department

Applications should consist of the following: cover letter, current resume including publication record, statement of research interests and plans (up to 5 pages), **statement of teaching interests and approach (up to 3 pages),** and names and complete contact information (including email addresses) of three references.

Tenure-Track Position, Department of Chemistry should include C.V., publication list, statement of present and future research interests (3-5 pages), **statement of teaching strengths (1-2 pages),**

Tenure-Track Position, Assistant Professor

Applicants should send a vita, three letters of reference, copies of transcripts, a statement of teaching interests,

Participants leave this workshop with:

- Familiarity with the concepts of scientific teaching
- Experience with online learning
- Knowledge of the essentials of a student-centered classroom
- Information on resources for teaching
- Strategies for engaging students in the classroom
- Practice using technology & software to support teaching
- Plans for (and screencast of) a demonstration class session
- A statement of teaching interests