Scientific Teaching

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The Wisconsin Program for Scientific Teaching

Part of the Teaching Mentoring Program
Sponsored by the CVM Teaching Academy
Presented by: John Nilson & Kay Brothers
"I wasn’t trained as a teacher, how can Scientific Teaching help me?"

- Learn about scientific teaching
- Explore misconceptions of scientific teaching
- Explore an ongoing process to make teaching more scientific and evidence based
The Call for Good Science Teaching

- Report offering recommendations for a new biology curricula that better reflects the dynamic and interdisciplinary nature of science with a rapidly changing frontier (NRC 2003, *Bio2010*)

- Charged higher education with “…teaching scientific habits of mind.” (AAAS, 1990; NRC, 2003)

- Recognized that employers are demanding more efficient and effective problem-solving and analytic skills along with the ability to work in teams (AAAS, 1990)
Case of the Frustrated Professor

Before the semester started, I worked really hard to set goals for the course. During the semester, I have been covering the content in clear, efficient, lectures that I think are really well-organized, but the students don’t seem to be learning the material. In fact, 40% of students failed the first exam.

Students these days don’t know how to take notes and study. They just don’t get it.

How many of you have faced or witnessed a similar course challenge?
The Good, the bad, the ugly
Small Group Discussion

- Where did the economics teacher go wrong?
- How was the physics teacher different?
What is Scientific Teaching?

“What teaching science in a way that

1. Represents the nature of science as a dynamic, investigative process based on evidence,

2. Engages a diversity of people in a collaborative process and

3. Has clear learning goals in mind, uses methods and instructional materials designed to improve student learning, and evaluates the methods iteratively.”
What is the nature of science?

- How does the paper contribute to the true nature of science?
- Why is the SP a fraud?
- What is the true nature of the “hypothesis”
- What’s the difference between deduction and induction
- Does published science build on the work of others? What is the implication for ST?
- Does ST focus on facts or discovery?
- What is the principle of limited sloppiness?
- Why is the social side of science important?
- Is good in exams enough preparation for good science?
- Is science just about collecting facts?
What is the nature of science?

- Final Take Home

“... students need to learn that mistakes or false starts are not time wasted, but are an essential part of making progress. They also need to understand that the scientific method is not a series of well-defined steps that always produce an answer, but a dynamic process that requires intellectual engagement and judgment.”
Three Pillars of Scientific Teaching

- Active Learning
- Assessment, both formative and summative
- Diversity, through cooperative/collaborative groups
Large Group Discussion

- What are the barriers to scientific teaching?
- How can barriers be removed?
Prelude to Session II: Tools to EnGauge Students

- Brainstorming
- Case Studies
- “Clicker” questions
- Decision making
- Group exams
- One-minute papers
- Pre/post questions
- Strip sequences
- Think-pair-share
Exit Assessment

Address the following questions in one minute or less:

- What is scientific teaching?
- Give an example