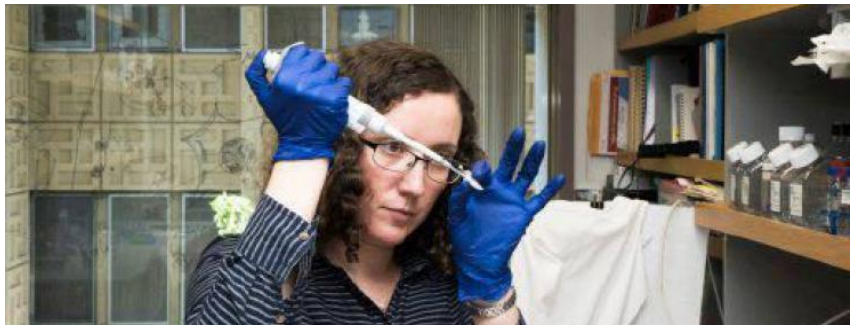
A SCIENTIFIC TEACHING WORKSHOP FOR STANFORD POSTDOCS

LAWRENCE URICCHIO
WHITNEY HEAVNER

POSTDOC “VS” PROFESSOR



Postdoc	Professor
Research	Research
Research	Teaching
Research	Lab/grant administration
Some more research	Service

SHOULD WE RECONSIDER THE CURRENT TRAINING MODEL FOR POSTDOCS?

Potential benefits of postdocs training in teaching:

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Potential detriments:

- **Decreased research efficiency (costly on job market)**
- **Loss of student-faculty interaction time**

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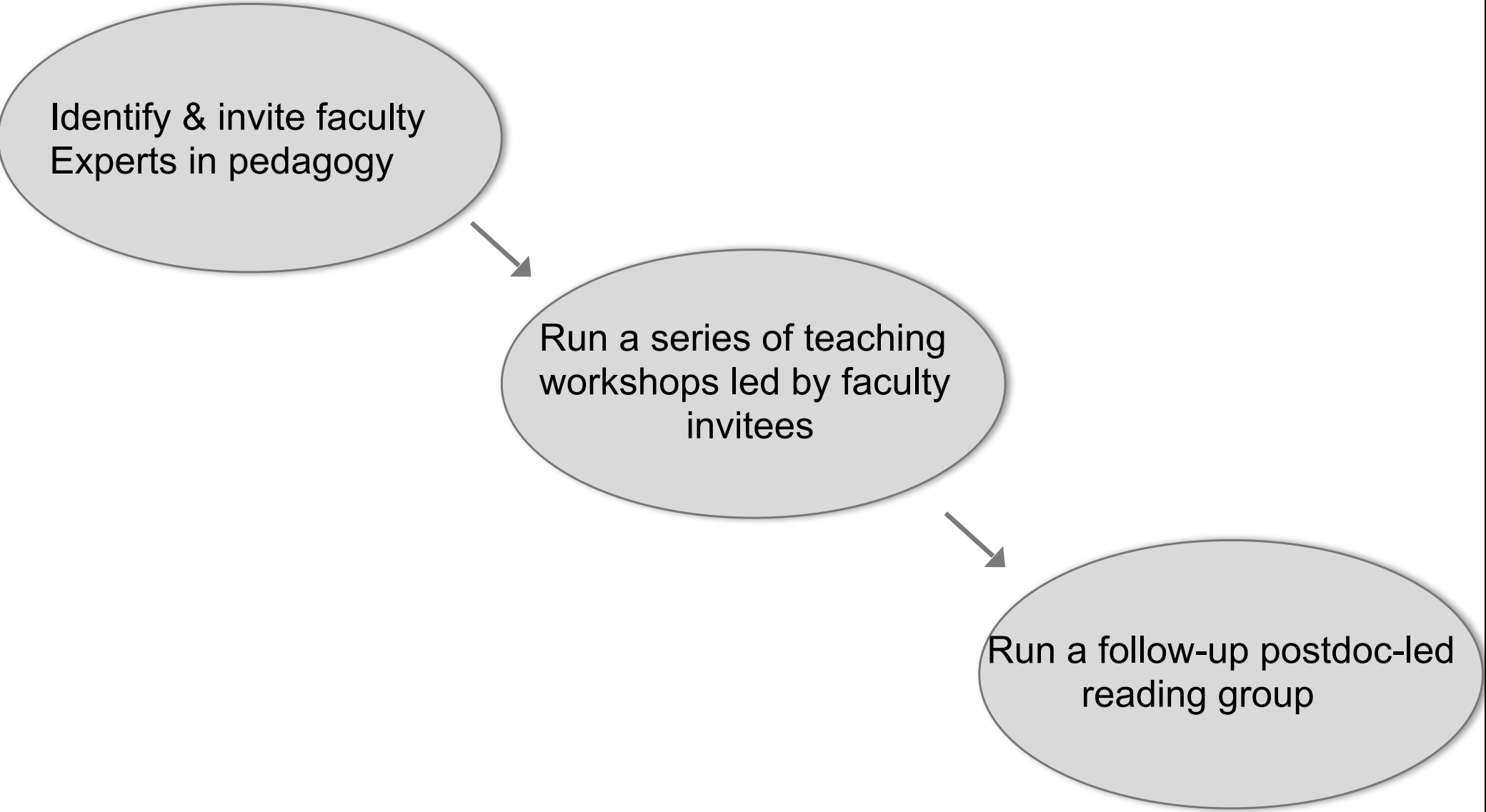

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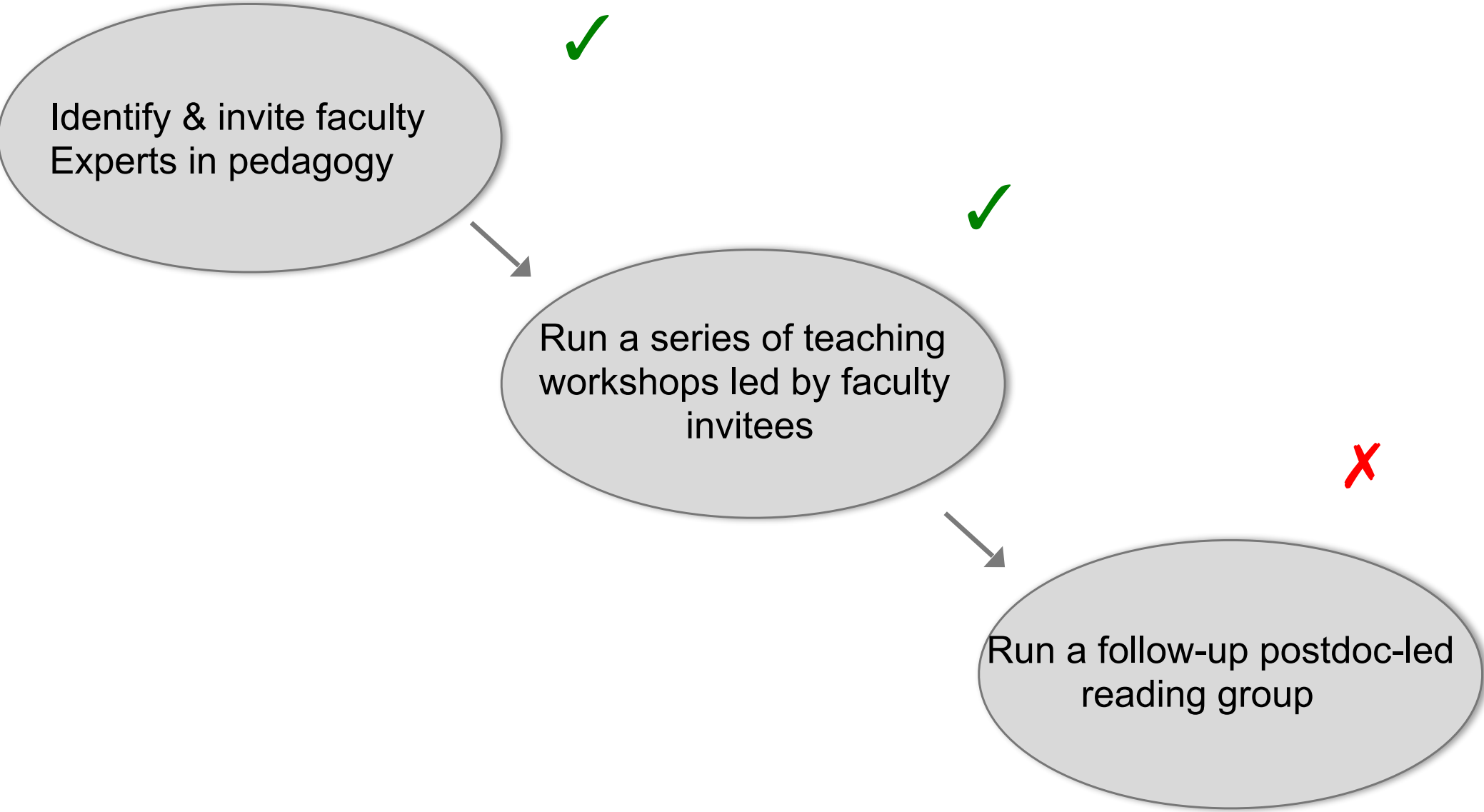

WHAT IS SCIENTIFIC TEACHING?

"Scientific teaching involves active learning strategies to engage students in the scientific process and teaching methods that have been tested and systematically shown to reach diverse students."
Handelsman *et al*, *Science* 2004

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*"Scientific teaching involves **active learning** strategies to engage students in the **scientific process** and teaching methods that have been **tested** and systematically shown to **reach diverse students."*** **Handelsman *et al*, *Science* 2004**

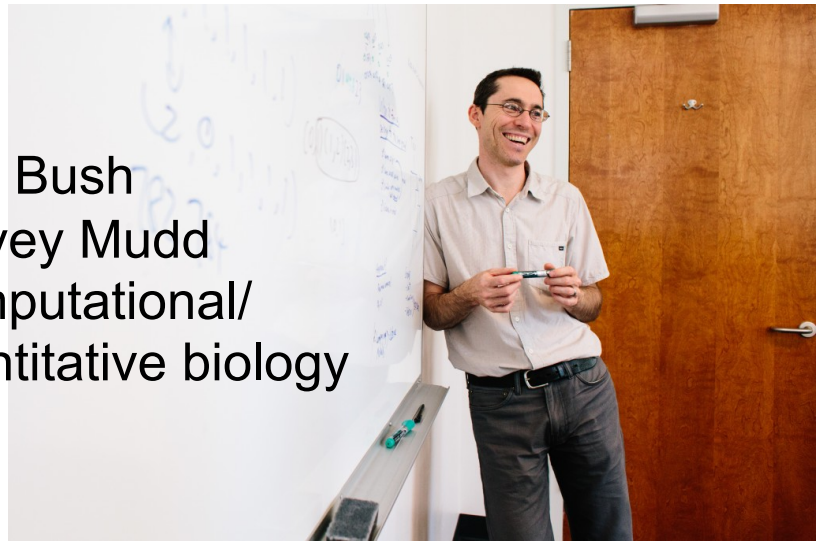
- **Active learning & classroom engagement**
- **Quantitative approaches in the classroom**
- **Assessment of students and teaching efficacy**
- **Inclusion in the classroom**

A POSTDOC TEACHING MINI-SERIES

Katie Wilkinson
SJSU
Active Learning

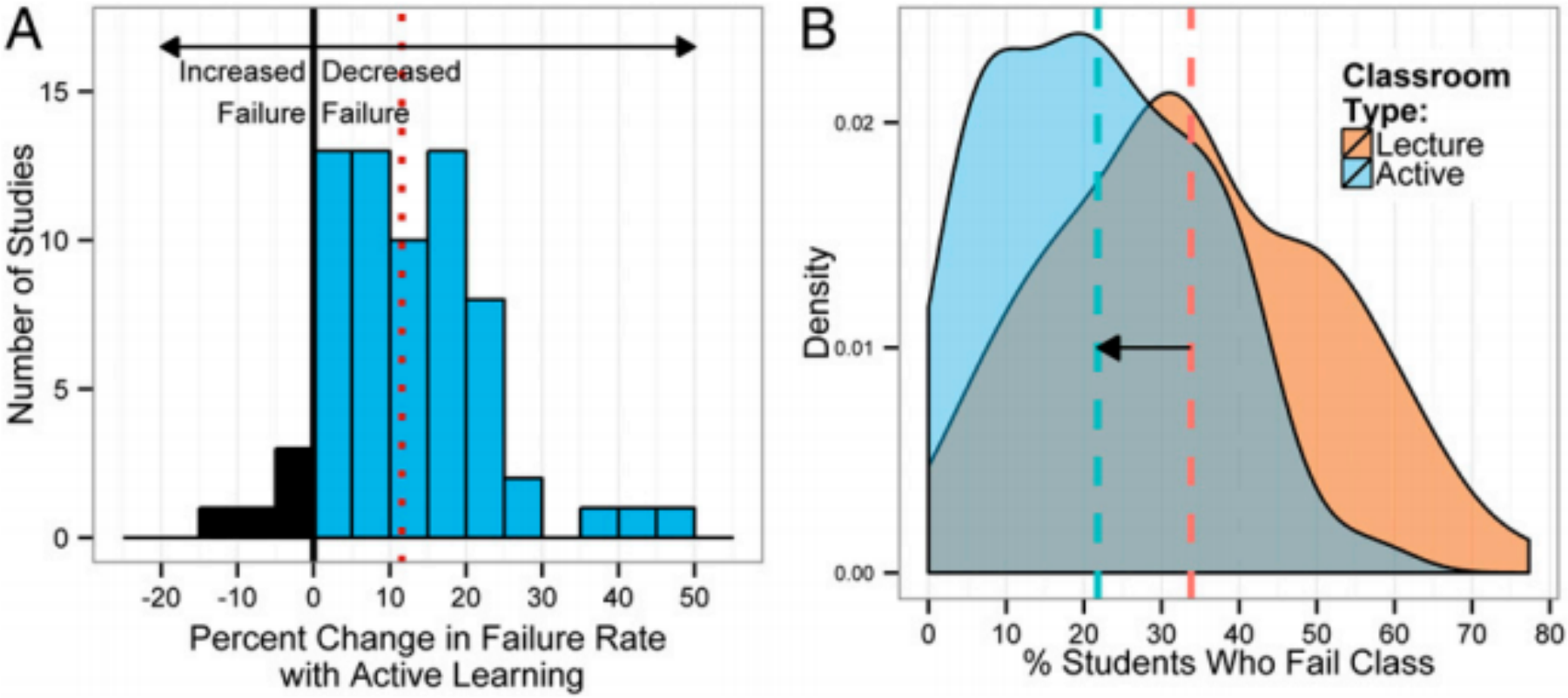
Jeff Schinske
Foothill/De Anza
Inclusion

Eliot Bush
Harvey Mudd
Computational/
quantitative biology



Sarah Bissonnette
CSU-Stanislaus
Assessment

WHY USE A SCIENTIFIC & ACTIVE APPROACH TO TEACHING?



Freeman *et al* 2014 PNAS

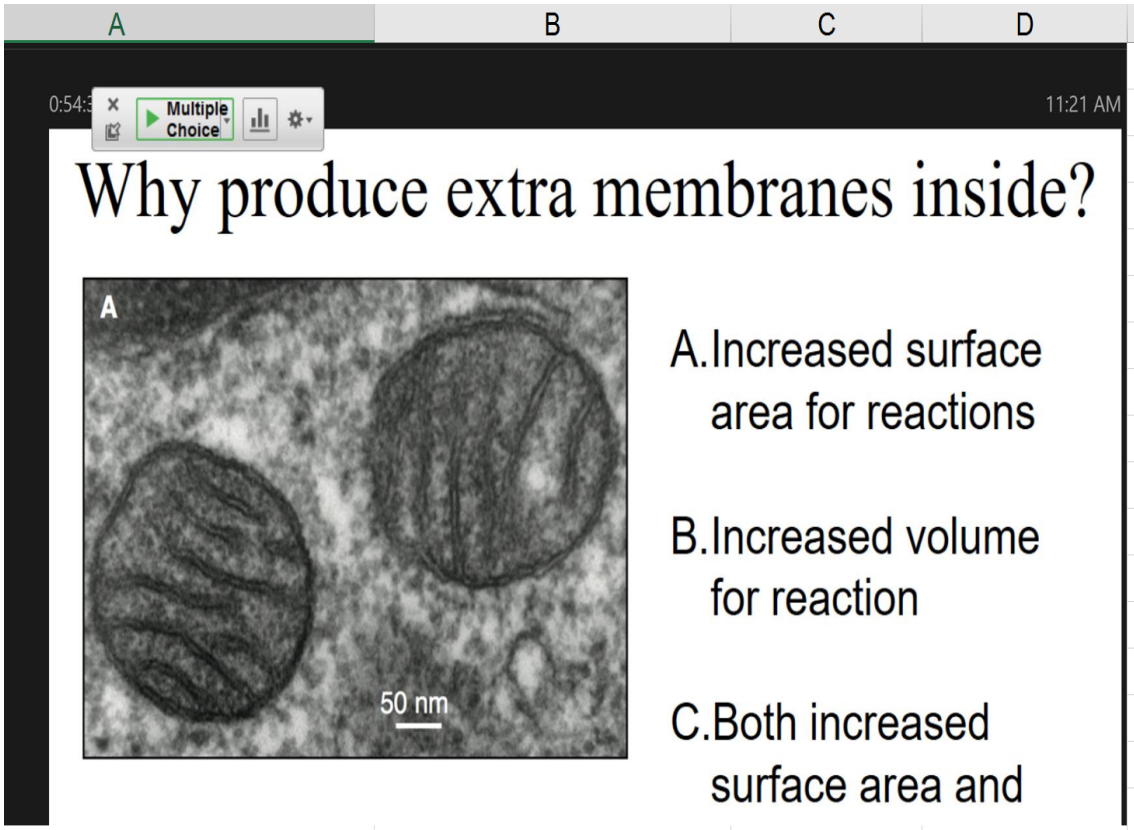
WHAT TYPES OF TOOLS SHOULD WE BE AWARE OF?

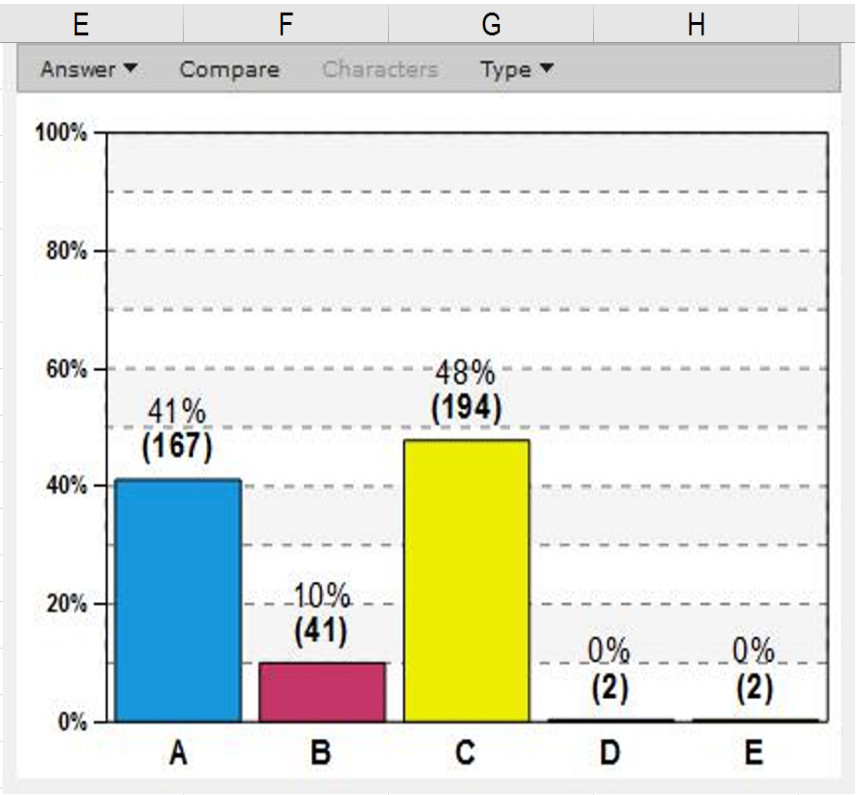
There are numerous ways to make even large classes more interactive

- **Think-pair-share**
- **Just-in-time teaching methods**
- **Flipped classroom**
- **POGIL (process oriented guided inquiry learning)**
- **PLTL (peer led team learning)**

Slide by Katie Wilkinson

WHAT SHOULD YOU DO IF YOU GOT THIS RESPONSE TO A CLICKER QUESTION?

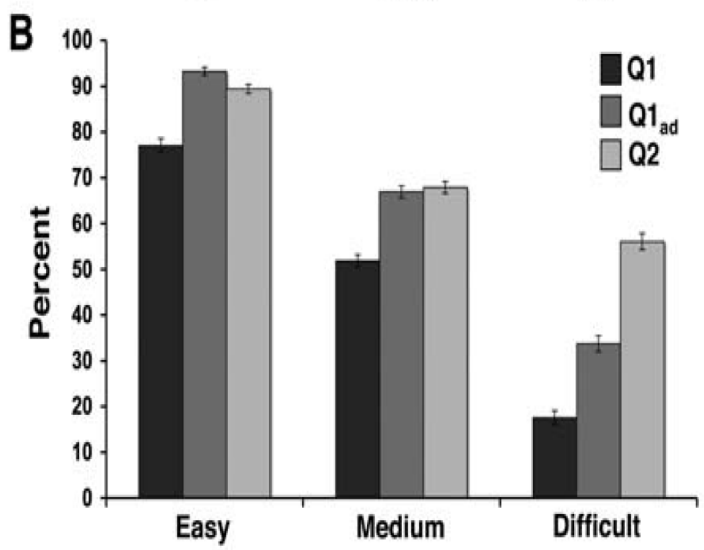




USE PEER DISCUSSION TO MAXIMIZE IMPACT OF CLICKER QUESTIONS

Slide by Katie Wilkinson

Peer discussion improves performance on re-vote of same question (Q1ad) as well as individual performance of a similar question asked later



Smith, Michelle K., et al. "Why peer discussion improves student performance on in-class concept questions." Science 323.5910 (2009): 122-124.

ASSESSMENT

Slide by Sarah Bissonnette

Clicker Question

When planning a new course, how would you decide what to teach?

I would start with…

a) the final exam
b) the textbook table of contents
c) a topic list from my department
d) a colleague's syllabus
e) none of the above

Assessment example:
Clicker Question

ASSESSMENT

Slide by Sarah Bissonnette

Introduction to Backwards Design

Standard Course Planning	Backwards Design
Choose textbook	Formulate broad learning goals/ specific learning objectives
⇓	⇓
Create syllabus	Design assessments (formative (HW, class activities) and summative (tests))
⇓	⇓
Write/ revise lectures, notes	Develop learning activities (lectures, homework, other)
⇓	
Prepare PowerPoint presentations	
⇓	
Write exams	
Instructor-centered	**Student-centered**

Backwards Design

Wiggins, G. and McTighe, J. (1998) Understanding by design, Assoc. for Supervision and Curriculum Development, Alexandria, VA.

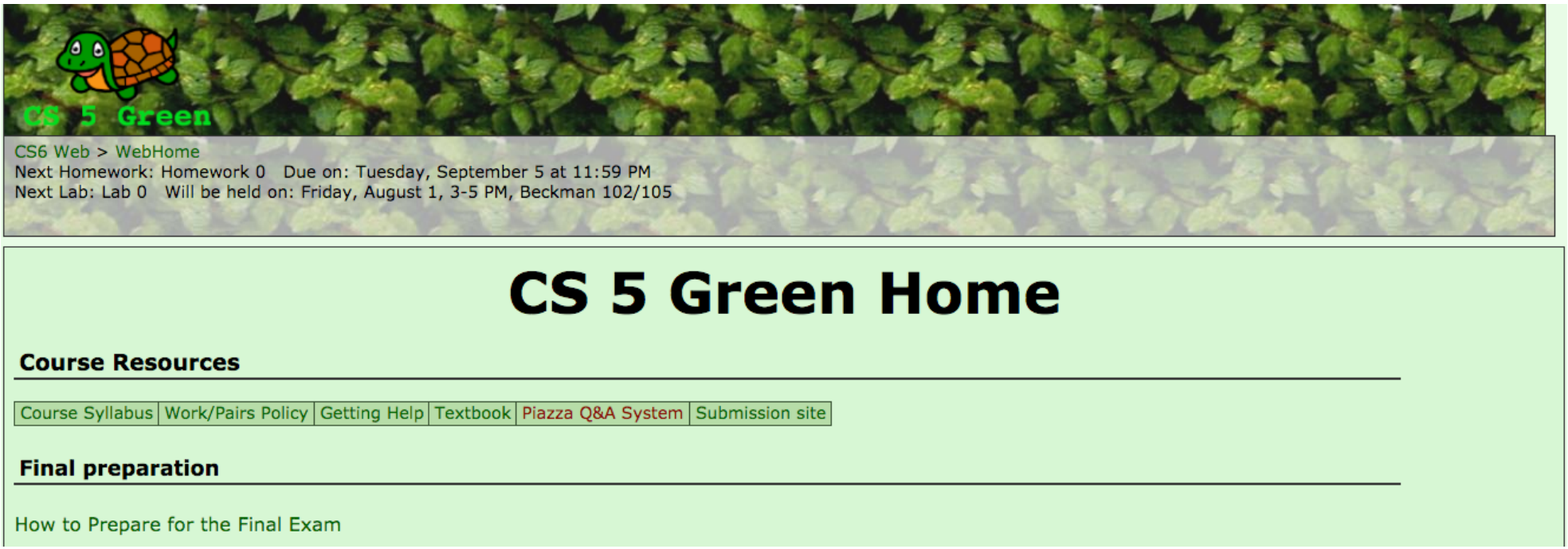
Adapted from William Wood, NAS/HHMI Summer Institute Presentation

Slide by Sarah Bissonnette

Take home message #1..

Writing exams (designing assessments) should happen EARLY in the process of planning a course.

QUANTITATIVE BIOLOGY



Most computer science majors in the U.S. are men. Not so at Harvey Mudd

At Harvey Mudd more than half of computer science graduates are women. (Irfan Khan / Los Angeles Times)

By Rosanna Xia • Contact Reporter

JANUARY 4, 2017, 4:00 AM

Veronica Rivera signed up for the introduction to computer science class at Harvey Mudd College mostly because she had no choice: It was mandatory. Programming was intimidating and not for her, she thought.

DIVERSITY & INCLUSION

- **Students of different backgrounds can experience the learning environment very differently**

- **Negative stereotypes can affect student performance *even if these stereotypes are not explicitly or implicitly endorsed by instructors or peers***

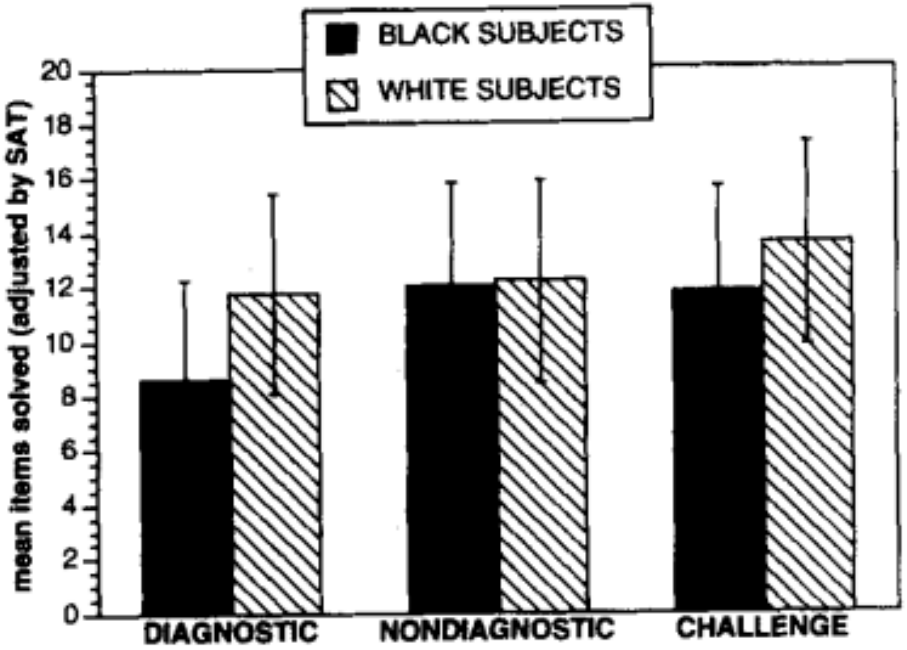


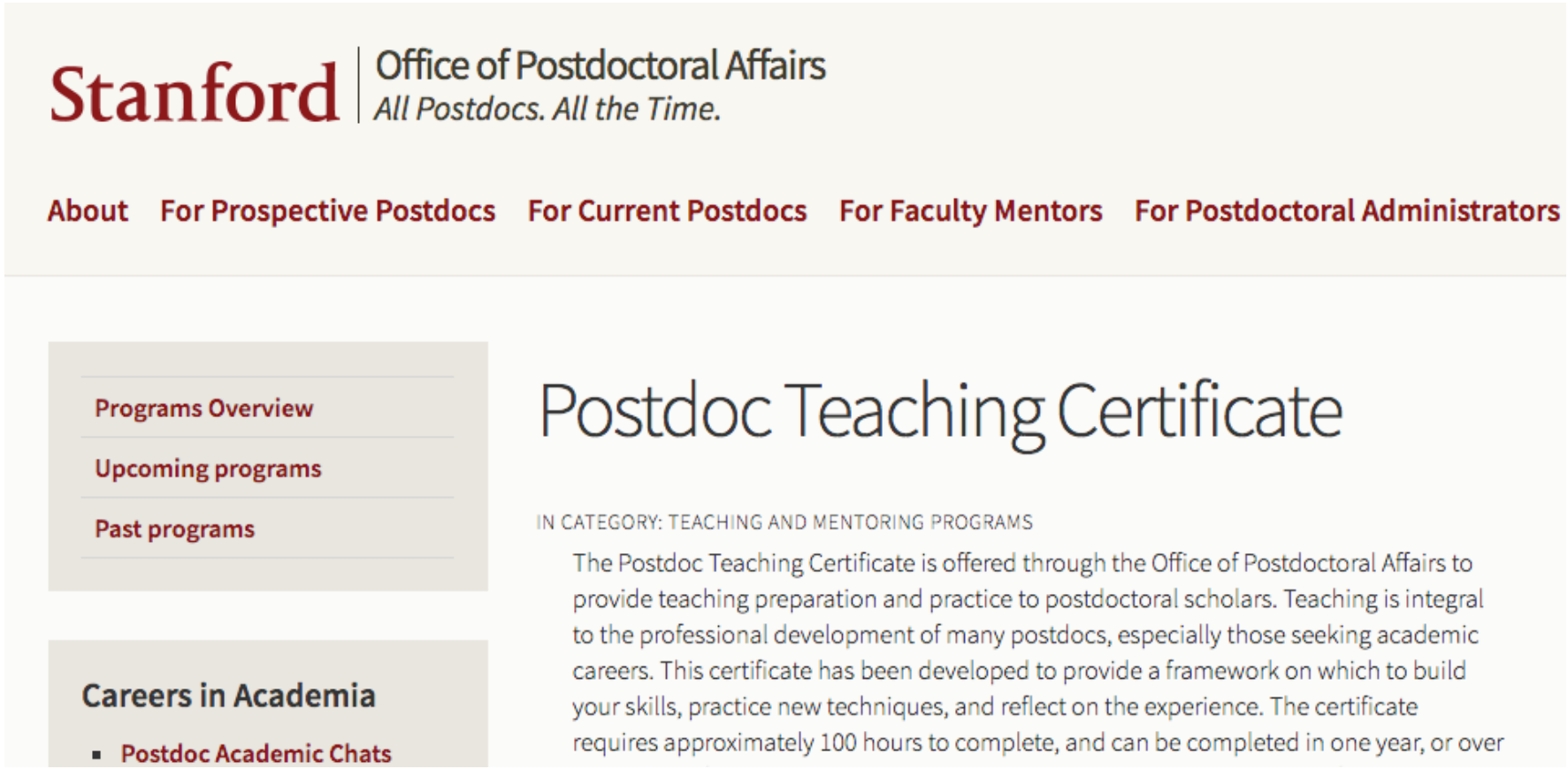
Figure 1. Mean test performance Study 1.

Steele & Aronson, 1995

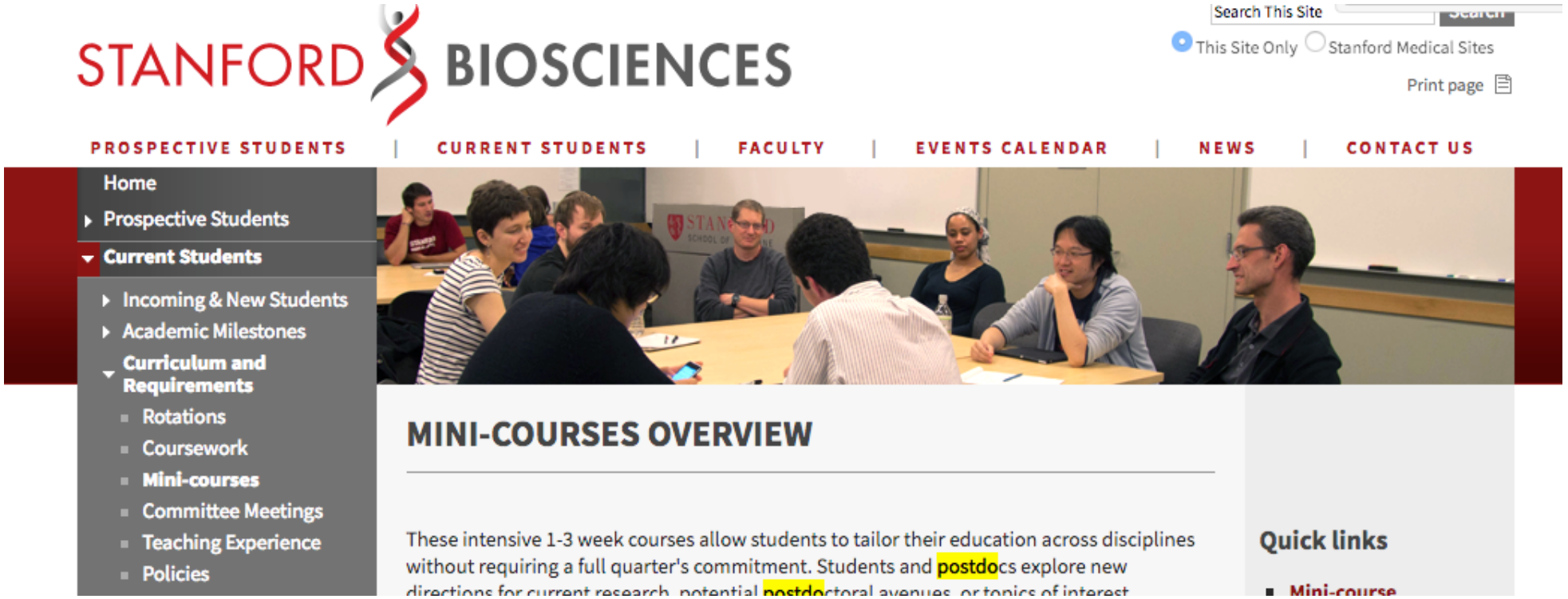
WHY DON'T STUDENTS HAVE AN INCLUSIVE VIEW OF SCIENTISTS?

Credit to Jeff Schinske for this idea

STANFORD TEACHING OPPORTUNITIES FOR POSTDOCS-1



STANFORD TEACHING OPPORTUNITIES FOR POSTDOCS-2



STANFORD TEACHING OPPORTUNITIES FOR POSTDOCS-3

Postdocs can also…

- **Join the postdoc pedagogy journal club to present or participate**
- **Teach at community colleges or teaching colleges (opportunities often shared on the postdoc teaching listserv)**
- **Contact VPTL for course offerings**
- **Apply for IRACDA (if renewed)**

TAKE-AWAY MESSAGES

- In a perfect world, postdocs should devote a greater portion of their effort to teaching/training in evidence-based approaches
- Evidence-based active learning can improve student outcomes
- Developing assessments in tandem with course objectives can make assessments more effective
- Active & evidence-based approaches have the potential to reduce achievement gaps and improve learning environments

ACKNOWLEDGEMENTS

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