

# **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?**

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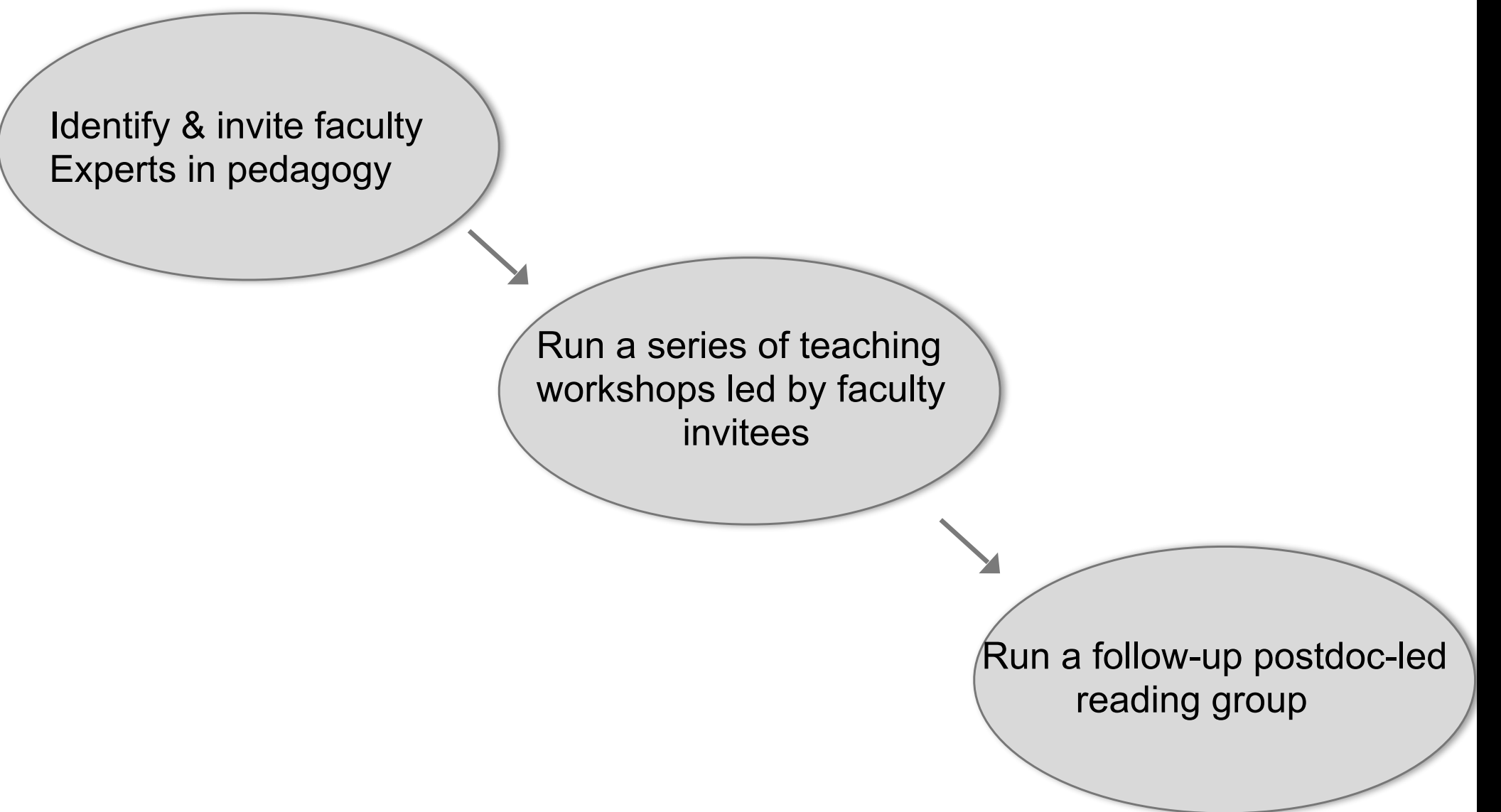
- **Increased teaching effectiveness as junior faculty**
- **Increased competitiveness on job market (potentially)**
- **Decreased time burden as junior faculty**
- **Increase classroom inclusivity**

**Potential detriments:**

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

# A TEACHING WORKSHOP FOR POSTDOCS

Identify & invite faculty  
Experts in pedagogy



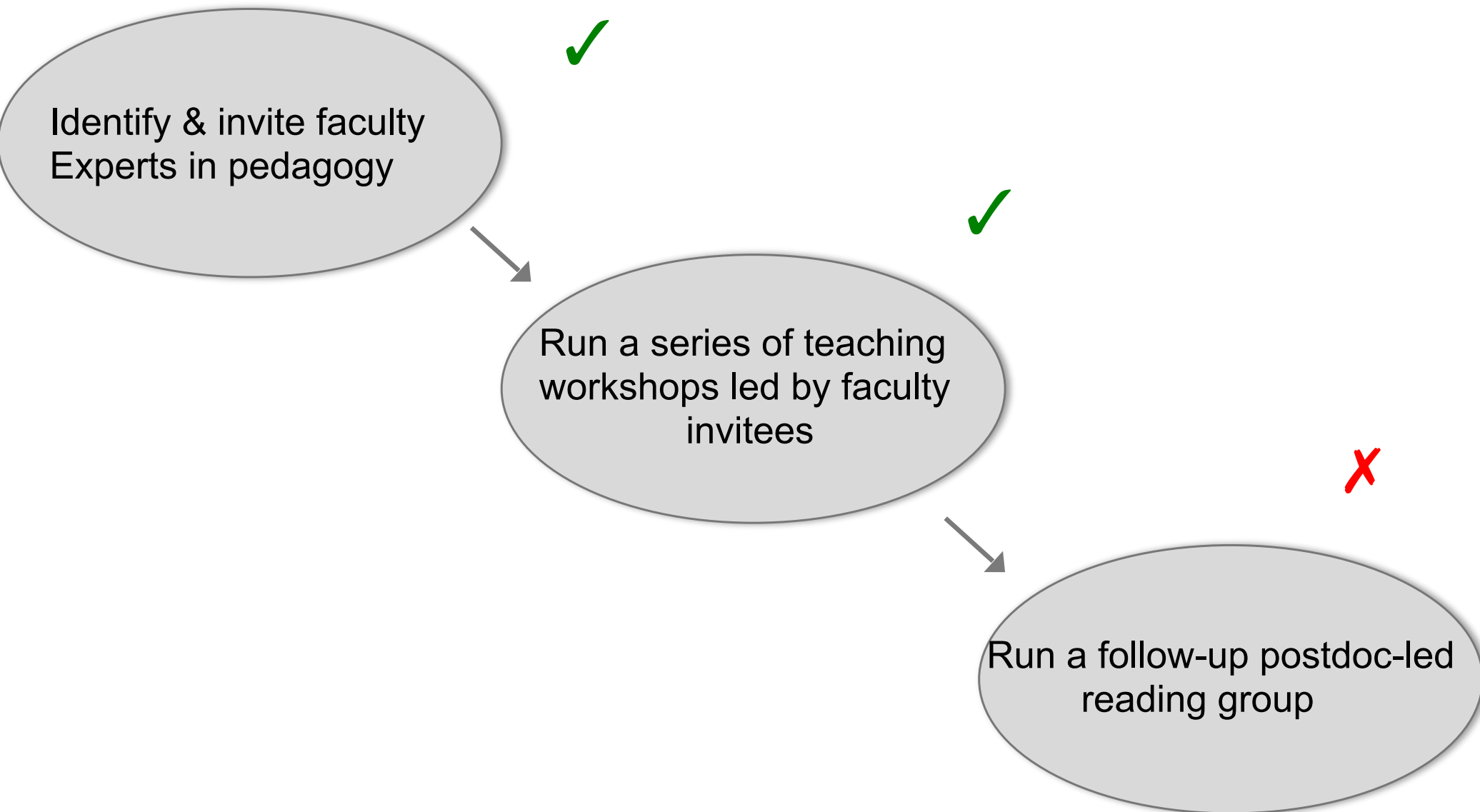
```
graph TD; A([Identify & invite faculty  
Experts in pedagogy]) --> B([Run a series of teaching  
workshops led by faculty  
invitees]); B --> C([Run a follow-up postdoc-led  
reading group]);
```

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# A TEACHING WORKSHOP FOR POSTDOCS



# WHAT IS SCIENTIFIC TEACHING?

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**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

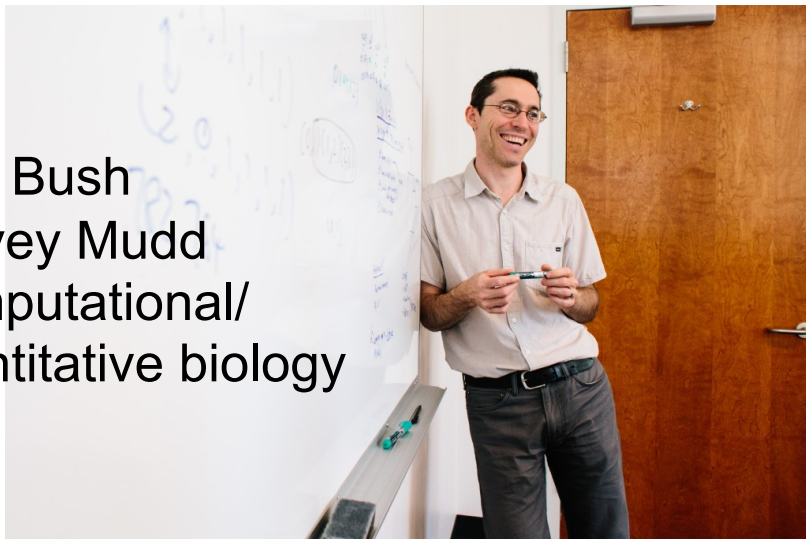
Katie Wilkinson  
SJSU  
Active Learning



Jeff Schinske  
Foothill/De Anza  
Inclusion



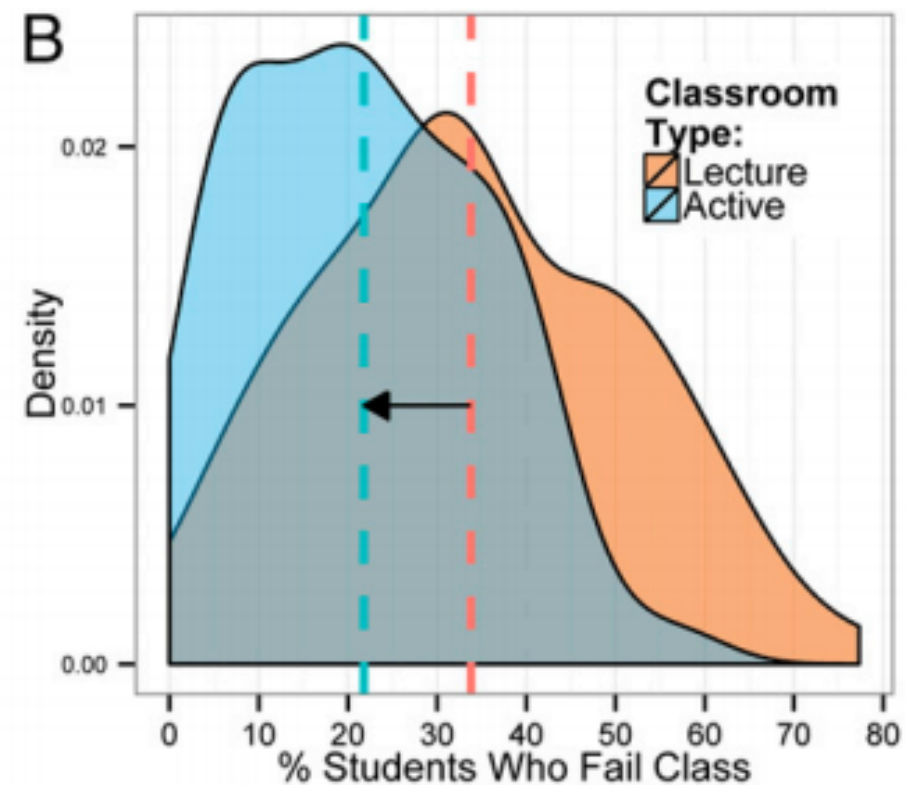
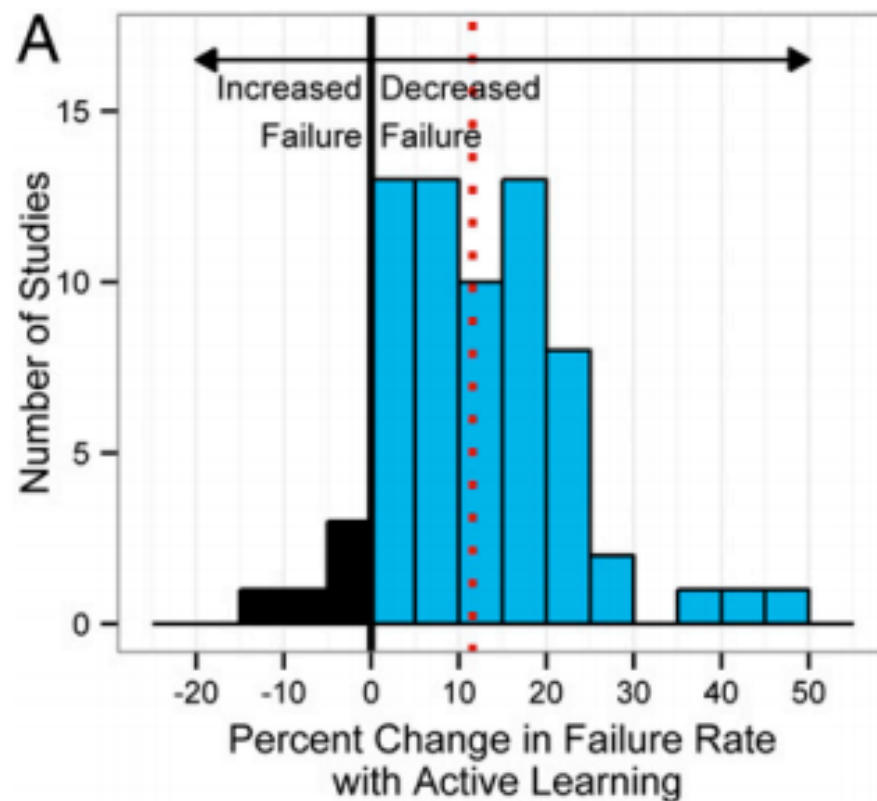
Eliot Bush  
Harvey Mudd  
Computational/  
quantitative biology



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?**

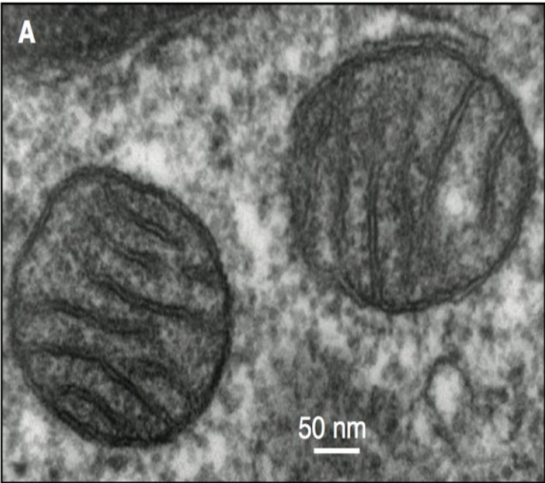
**There are numerous ways to make even large classes more interactive**

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

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

0:54:33 Multiple Choice 11:21 AM

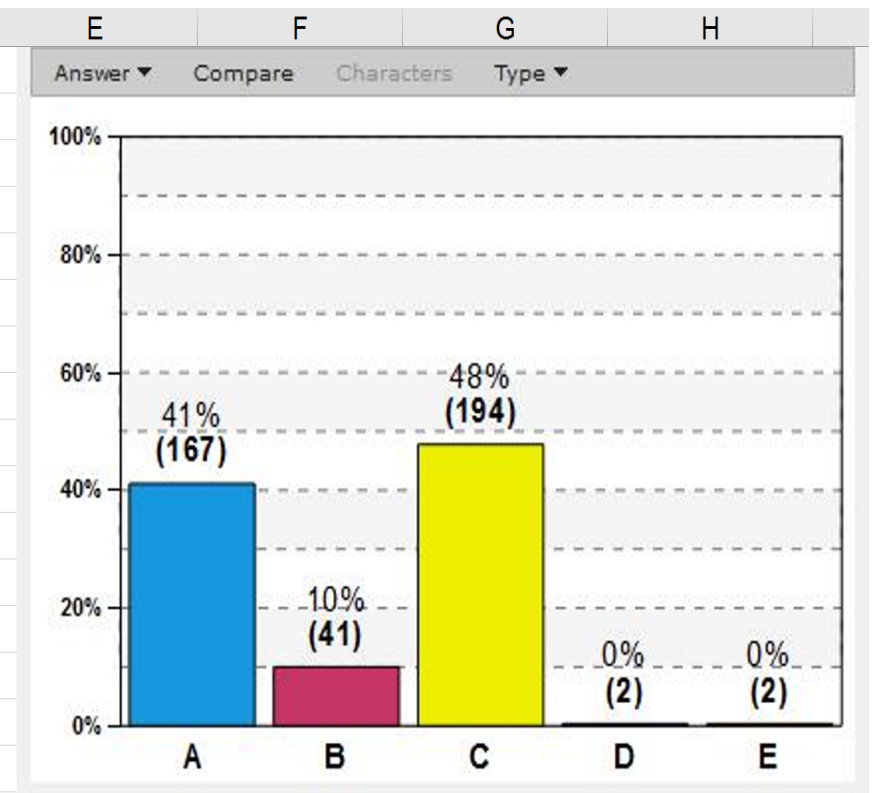
Why produce extra membranes inside?



A. Increased surface area for reactions

B. Increased volume for reaction

C. Both increased surface area and

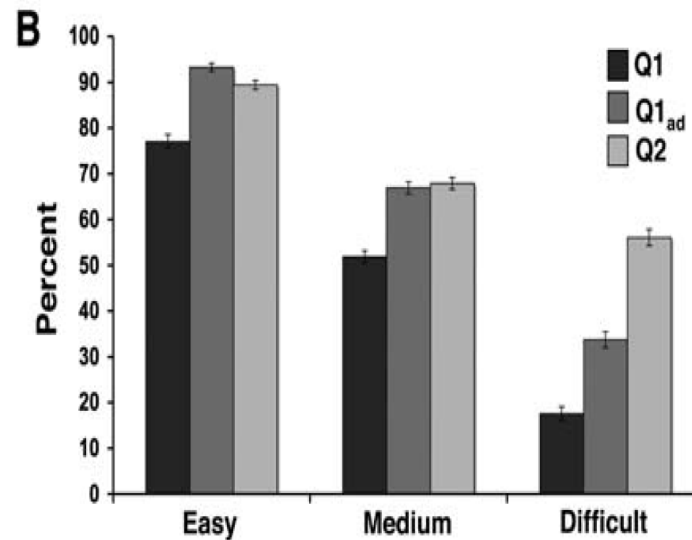




# USE PEER DISCUSSION TO MAXIMIZE IMPACT OF CLICKER QUESTIONS

Slide by Katie Wilkinson

Peer discussion improves performance on re-vote of same question (Q1<sub>ad</sub>) 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

# Clicker Question

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

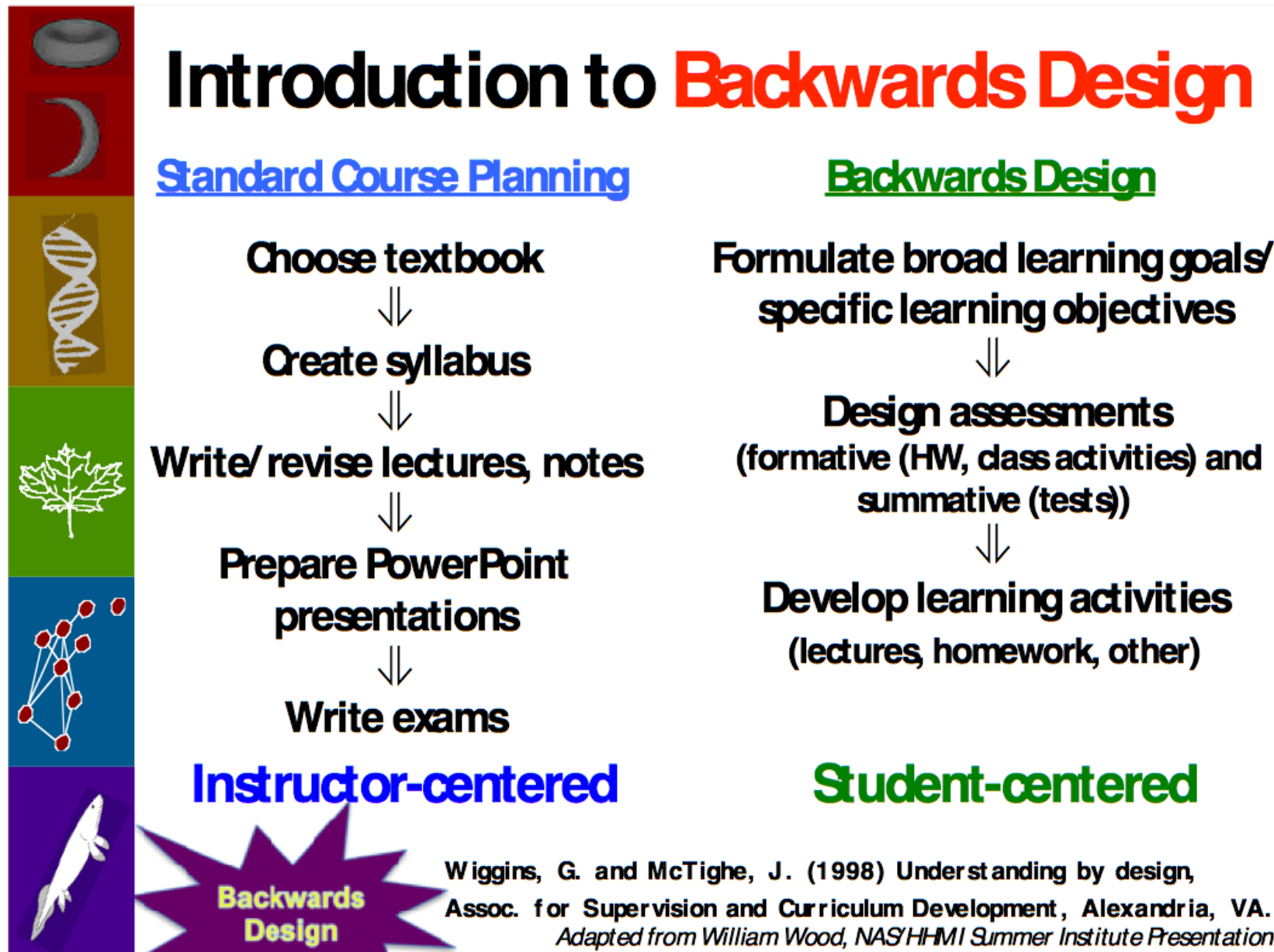
*I would start with...*

- 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**

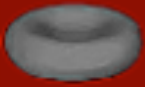
# ASSESSMENT

Slide by Sarah Bissonnette



# Take home message #1..

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



# QUANTITATIVE BIOLOGY



## CS 5 Green

CS6 Web > WebHome

Next Homework: Homework 0 Due on: Tuesday, September 5 at 11:59 PM

Next Lab: Lab 0 Will be held on: Friday, August 1, 3-5 PM, Beckman 102/105

## CS 5 Green Home

### Course Resources

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[Course Syllabus](#) [Work/Pairs Policy](#) [Getting Help](#) [Textbook](#) [Piazza Q&A System](#) [Submission site](#)

### Final preparation

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[How to Prepare for the Final Exam](#)

# 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

**V**eronica 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.

ADVERTISEMENT



# 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*

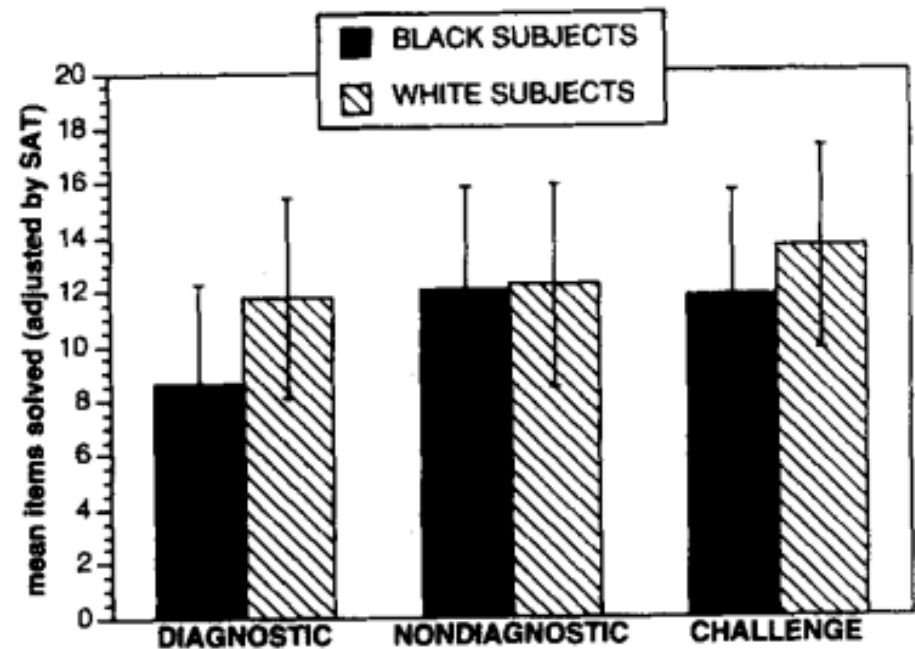


Figure 1. Mean test performance Study 1.

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** | Office of Postdoctoral Affairs  
*All Postdocs. All the Time.*

[About](#) [For Prospective Postdocs](#) [For Current Postdocs](#) [For Faculty Mentors](#) [For Postdoctoral Administrators](#)

[Programs Overview](#)

[Upcoming programs](#)

[Past programs](#)

## Careers in Academia

- [Postdoc Academic Chats](#)

## Postdoc Teaching Certificate

IN CATEGORY: TEACHING AND MENTORING PROGRAMS

The Postdoc Teaching Certificate is offered through the Office of Postdoctoral Affairs to provide teaching preparation and practice to postdoctoral scholars. Teaching is integral to the professional development of many postdocs, especially those seeking academic careers. This certificate has been developed to provide a framework on which to build your skills, practice new techniques, and reflect on the experience. The certificate requires approximately 100 hours to complete, and can be completed in one year, or over



# STANFORD TEACHING OPPORTUNITIES FOR POSTDOCS-2



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► Incoming & New Students

► Academic Milestones

▼ Curriculum and Requirements

■ Rotations

■ Coursework

■ Mini-courses

■ Committee Meetings

■ Teaching Experience

■ Policies



## MINI-COURSES OVERVIEW

These intensive 1-3 week courses allow students to tailor their education across disciplines without requiring a full quarter's commitment. Students and **postdocs** explore new directions for current research, potential **postdoctoral** avenues, or topics of interest.

### Quick links

■ **Mini-course**

# **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

- **Whitney Heavner**
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- Sophie Kleppner
- John Boothroyd
- Susan McConnell