Structure Matters: 21 Teaching Strategies to Promote Student Engagement and Cultivate Classroom Equity and Inclusion

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SEPAL

The Science Education Partnership & Assessment Lab

San Francisco State University

SEPAL: The Science Education Partnership and Assessment Laboratory

SEPAL

The Science Education
Partnership & Assessment Lab
San Francisco State University

(≈ The Tanner Laboratory)

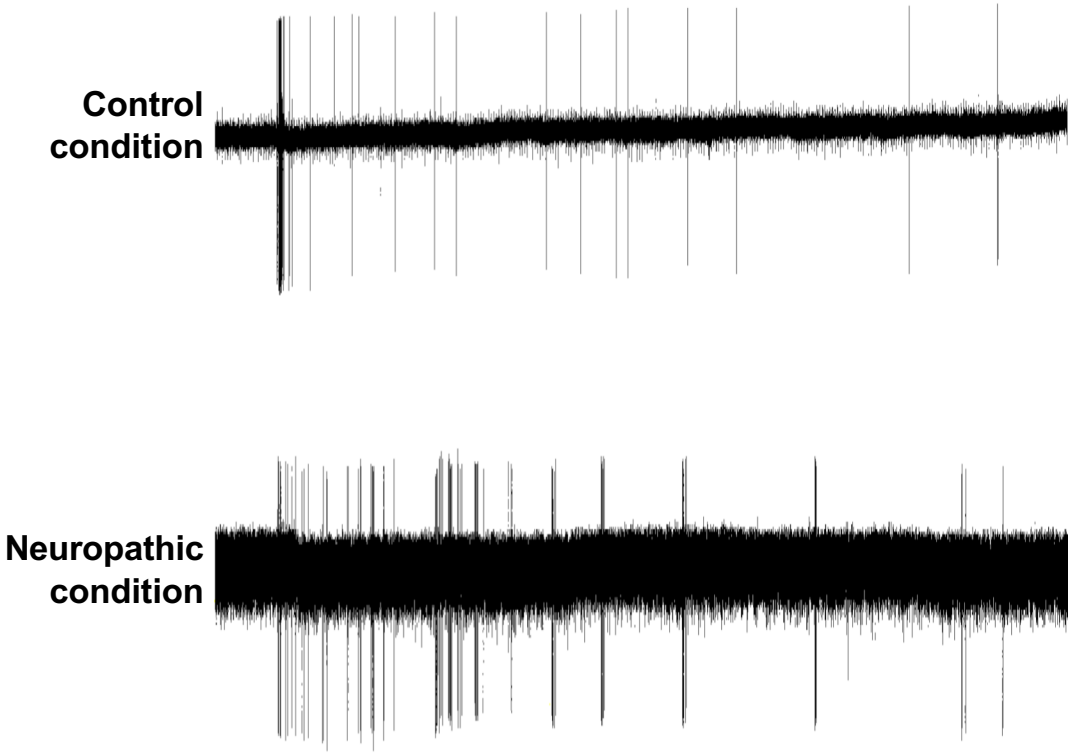
Founded in 2004…

- **Programs**
- **Coursework**
- **Research**

Funded by National Science Foundation (NSF) GK-12 Award, National Institutes of Health (NIH) Science Education Partnership Award, NSF Transforming Undergraduate Education in STEM (TUES) Award, NSF CAREER Award, and HHMI Undergraduate Science Education Award.

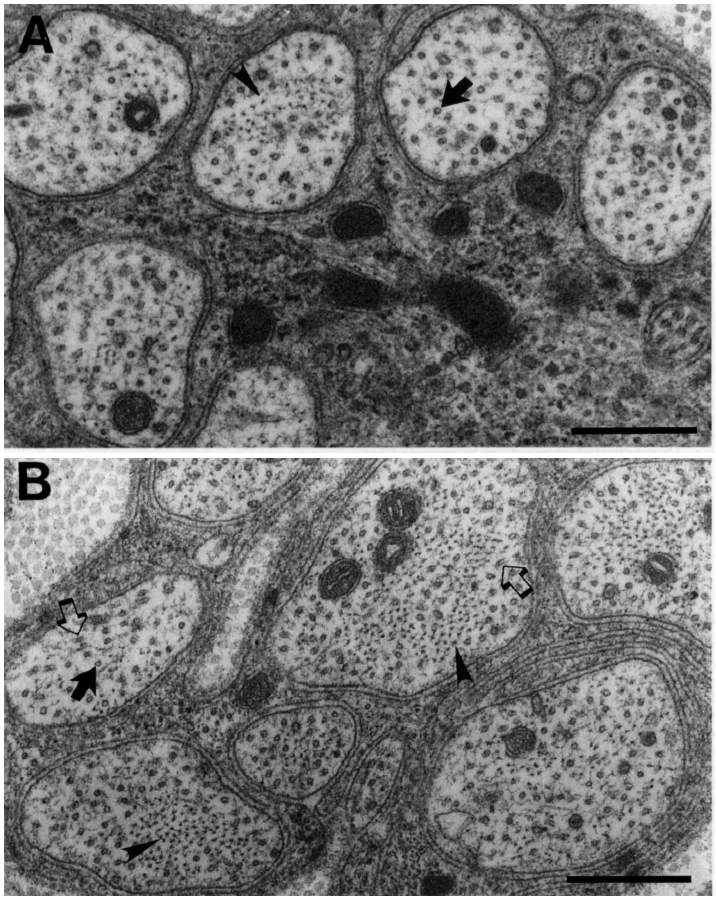
From First-generation College-going...
To Neuroscience Research…
To K-12 Science Education…
To Discipline-Based Biology Education Research…

Neurophysiology:
Single Unit Recording in Peripheral Nerve



Journal of Neuroscience, 1998
Neuroscience, 2002

Anatomy:
Electron Microscopy



Journal of Comparative Neurology, 1998
Journal of Comparative Neurology, 2000

Ideas that Drive SEPAL Research

- Twice as many undergraduates leave the sciences as the humanities in the U.S.

- Women and scientists of color continue to be underrepresented in the sciences

- Few scientists have formal training in teaching

- Research in biology education lags behind other science disciplines, but suggests many students not feeling included and not learning…

A Plan for Our Time Together…

- Introductions
- Common Learning Environment Experience
- 21 Teaching Strategies to Promote Student Engagement, Classroom Fairness, and Inclusion
- Another Consideration: Instructor Talk
- Another Resource: Scientist Spotlights

A Common Experience: Building Mobiles

What comes to mind when you hear the word "mobile?"

A Common Experience: Building Mobiles

- Construct a mobile with a partner.
- You will have ~10 minutes to construct your mobile.

Think!

Write on an index card…

1. Your name and institution

2. What are two important things to know about who you are and what you value? (cultural background, preferred pronouns, where you were born, partners/family, and/or…)

3. How aware were you about what materials other groups had? And if you were aware, how did it feel to have different materials than other groups?

Meet a New Colleague!

Share with your neighbor…

1. Your name and institution

2. What are two important things to know about who you are and what you value? (cultural background, preferred pronouns, where you were born, partners/family, and/or…)

3. How aware were you about what materials other groups had? And if you were aware, how did it feel to have different materials than other groups?

Debriefing the Mobiles Experience:

About Awareness…

- How *aware* were you about what materials other groups had?
- If you were *aware*, how did it feel to have different materials than other groups?

Debriefing the Mobiles Experience:

About Actions…

- Did your team *ask another team for materials*? Why or why not?

- Did your team *offer another team materials*? Why or why not?

What might the “Resource Bag” represent in terms of how students experience classrooms differently from one another?

-
-
-
-
-
-
-
-

Big Idea: Structuring Learning Environments Promotes Fairness and Access for All Students

Moving away from assumptions that students are lacking…

STUDENT DEFICIT MODEL

Moving towards the idea that learning environments are lacking (in structure)…

LEARNING ENVIRONMENT DEFICIT MODEL

The Results of Unstructured Classroom Environments

CBE—Life Sciences Education
Vol. 13, 478–492, Fall 2014

Article

Gender Gaps in Achievement and Participation in Multiple Introductory Biology Classrooms

Sarah L. Eddy,*† Sara E. Brownell,†‡ and Mary Pat Wenderoth*

*Department of Biology, University of Washington, Seattle, WA 98195; ‡School of Life Sciences, Arizona State University, Tempe, AZ 85287

PLOS | ONE

RESEARCH ARTICLE

Males Under-Estimate Academic Performance of Their Female Peers in Undergraduate Biology Classrooms

Daniel Z. Grunspan[1☯]*, Sarah L. Eddy[2☯], Sara E. Brownell[3], Benjamin L. Wiggins[4], Alison J. Crowe[4], Steven M. Goodreau[1]

1 Department of Anthropology, University of Washington, Seattle, WA, 98185, United States of America, **2** Texas Institute for Discovery Education in Science, College of Natural Sciences, University of Texas at Austin, Austin, TX, 78712, United States of America, **3** School of Life Sciences, Arizona State University, Tempe, AZ, 85287, United States of America, **4** Department of Biology, University of Washington, Seattle, WA, 98195, United States of America

CrossMark

But Kimberly,

what can I do tomorrow

to make my classroom,

lab meeting, faculty meeting,

(name any number of professional science environments…conferences, seminar talks, etc),

more fair and more inclusive?!?!

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Feature
Approaches to Biology Teaching and Learning

Structure Matters: Twenty-one Teaching Strategies to Promote Student Engagement and Cultivate Classroom Equity

Kimberly D. Tanner

Department of Biology, San Francisco State University, San Francisco, CA 94132

Strategies That Structure Learning Environments and Promote Fairness in Undergraduate Classrooms

- With a new partner, read through and discuss the descriptions of the 21 Teaching Strategies…

- In the margin, mark strategies with…
  - a "?" if you'd like to know more
  - a " " if it's already familiar to you

Strategies That Structure Learning Environments and Promote Fairness in Undergraduate Classrooms

- With your partner, self-assess your previous experience using each of the 21 Teaching Strategies and record this on the worksheet on the back.

- In particular, mark each strategy with …

  "N" for never used,
  "O" for occasionally use, or
  "R" for regularly use
  "W" for "would like to try!"

Structure Matters – 21 Simple Equity Strategies

1. Think-Pair-Share
2. Ask Open-ended Questions
3. Allow Students Time to Write
4. Multiple Hands, Multiple Voices
5. Wait Time
6. Hand Raising
7. Use Popsicle Sticks/Index Cards
8. Assign Reporters for Small Groups
9. Whip
10. Don't Judge Responses
11. Use Praise with Caution
12. Learn Students' Names
13. Use Varied Active Learning Strategies
14. Collect Assessment Evidence from Every Student, Every Class
15. Work in Stations/Small Groups
16. Monitor Student Participation
17. Integrate Culturally Diverse and Relevant Examples
18. Establish Classroom Community and Norms
19. Don't Plan Too Much
20. Be Explicit About Promoting Access and Equity for All Students
21. Teach Students from the Moment They Arrive

Structure Matters – 21 Simple Equity Strategies

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In what other professional settings could you use these strategies to promote inclusion?

How might Mobiles have been different if I had said…

"I expect everyone to share resources and ask for the support they need."

(13 words)

Another Consideration: Instructor Talk…

Beyond the Biology: A Systematic Investigation of Noncontent Instructor Talk in an Introductory Biology Course

Shannon B. Seidel,*† Amanda L. Reggi,* Jeffrey N. Schinske,‡ Laura W. Burrus,* and Kimberly D. Tanner*

*Department of Biology, San Francisco State University, San Francisco, CA 94132; †Department of Biology, Pacific Lutheran University, Tacoma, WA 98447; ‡Department of Biology, De Anza College, Cupertino, CA 95014

"I don't have a special email for you guys. You get the same email as my research colleagues and friends get. So anytime you want to email me, you use that."

"Some of the most important people in this room for you to be successful in [this course] are sitting around you, okay? They're not up on the stage."

"Some people find that if you haven't had a basic biology class before coming in here, it's a little harder. You've got to learn some of those basic concepts a little faster than other folks."

"You don't need to sneak in. You're right on time today for a change."

Another Resource: Scientist Spotlights…

Scientist Spotlight Homework Assignments Shift Students' Stereotypes of Scientists and Enhance Science Identity in a Diverse Introductory Science Class

Jeffrey N. Schinske,†* Heather Perkins,‡ Amanda Snyder,† and Mary Wyer‡
†Biology Department, De Anza College, Cupertino, CA 95014; ‡Psychology Department, North Carolina State University, Raleigh, NC 27695

Professor Jeff Schinske

Tenured Biology Instructor

Foothill-De Anza Community College District

Biol 640: ***Cellular Neuroscience***

Neuroscientist Journal Prompt #19

DUE by 11:55pm on Sunday, April 23rd, 2017

Your entry should be *at least* 400 words total, split between the questions at the bottom of the page.

Scientist Spotlight: Carl Hart

Carl Hart is a neuroscientist who is a professor in the departments of Psychology and Psychiatry at Columbia University. His research, which some people consider controversial, focuses on the neurobiological and behavioral effects of drugs and the biological, psychological, and social factors that influence drug use. He is also a leading advocate of changing American drug policy and drug law enforcement so that they are less discriminatory against communities of color and better reflect what science and evidence shows about drugs.

1) Please read the Prologue from Dr. Hart's book *High Price: A Neuroscientist's Journey of Self-Discovery that Challenges Everything You Know about Drugs and Society,* republished with his permission here: http://www.alternet.org/i-went-selling-drugs-studying-them-and-found-most-what-we-assume-about-drugs-wrong

2) Please read Dr. Hart's paper "Alternative reinforcers differentially modify cocaine self-administration by humans," (Hart et al, *Behavioural Pharmacology,* 2000) posted on iLearn.

If you'd like to know a little bit more about his particular paper, an article (with a video of an interview with Dr. Hart) is here: http://www.nytimes.com/2013/09/17/science/the-rational-choices-of-crack-addicts.html

(If you are interested in hearing more from Carl Hart, you can go to his website drcarlhart.com, where he has extensive links to his videos and writings.)

After reviewing these articles, write a 400 word or more reflection with your responses to what you read. You might wish to discuss:

1. **What was most interesting or most confusing about the articles about Dr. Hart?**
2. **What can you learn about the biological basis of drug addiction from these articles?**
3. **What do these articles tell you about the types of people that do science?**
4. **What new questions do you have after reviewing these articles?**

For Further Reading…

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CBE—Life Sciences Education
Vol. 13, 6–15, Spring 2014

Feature
Approaches to Biology Teaching and Learning

Considering the Role of Affect in Learni… Monitoring Students' Self-Efficacy… and Science Identity

Gloriana Trujillo and Kimber…

CBE—Life Sciences Education
Vol. 6, 251–258, Winter 2007

Feature
Approaches to Biology Teaching and Lea…

Cultural Competence in …

Kimberly Tanner* and D…

Language Matters: Considering Microaggressions in Science

Colin Harrison† and Kimberly D. Tanner‡*
†School of Biological Sciences, Georgia Institute of Technology, Atlanta, GA 30332; ‡Department of Biology, San Francisco State University, San Francisco, CA 94132

…es to Biology Teaching and Learning

Learning to See Inequity in Science

Kimberly D. Tanner

Is changing classrooms enough?

How do we go beyond classrooms and change the culture of science?

Scientific Presenting: Using Evidence-Based Classroom Practices to Deliver Effective Conference Presentations

Lisa A. Corwin,[†] Amy Prunuske,[‡] and Shannon B. Seidel[§*]

[†]Department of Ecology & Evolutionary Biology, University of Colorado, B… CO 80309; [‡]Department of Microbiology and Immunology, Medical Colle… Central Wisconsin, Wausau, WI 54401; [§]Biology Department, Pacific Luther… Tacoma, WA 98447

2018 LSE

When will effective teaching/communication strategies become commonplace in all scientific learning environment?

- Lab meetings
- Conferences
- Faculty meetings
- Grant meetings
- Everywhere…

Reflection and Pair Discussion…

On one side of your index card…

- One thing, if anything, that you learned in this session that will influence you in the future…

On one side of your index card…

- One thing, if anything, that surprised you during this session…

Thank you for choosing to spend your time with me today…

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A Common Experience: Building Mobiles

Adapted from Lawrence, S. M. (1998). Unveiling positions of privilege: A hands-on approach to understanding racism. Teaching of Psychology, 25, 198-200.

McIntosh, P. (2003). White privilege: Unpacking the invisible knapsack. In S. Plous (Ed.), Understanding Prejudice and Discrimination (pp. 191-195). New York: McGraw-Hill.