ABLE 2024 MINI WORKSHOP

Reflections on Who Belongs in Science: Curricular innovations implemented in an intro bio lab class

Jordan Balaban and **Jessica Goldstein**

Biology Department, Barnard College

Introductions

Context: Intro Bio at Barnard (STEM majors/Pre-health)

- Traditional lecture format
- 250-person lecture class (1 hour, 3x weekly)
- 3-hour weekly lab (16 students/section)

Goals: Revise Curriculum to promote Equity and Inclusion

- Create open class climate that promotes peer interactions and relationship building
- Highlight work of diverse scientist perspectives and voices to counteract stereotypes and highlight value of diversity
- Reveal “hidden curriculum”

Modular Activities Implemented in Lab

1. Values Affirmation Writing Reflection

2. Objectivity in Science: Zine Reading and Discussion

3. Undergraduate Research at Barnard College Activity

4. Scientist Spotlight Presentation Project

Activity 1:
Values Affirmation Writing Reflection

- Reflect on what values are important and how that shapes the way they live their life

- Evidence that this leads to persistence in STEM classes:
  - promotes self-worth
  - reduces stereotype threat
  - promotes social behavior → larger social network

- See Steele and Aronson, 1995; Miyake et al, 2010; Jordt et al, 2017; Turetsky et al, 2020; Dewsbury, 2020)

Values Affirmation: (Beginning of Semester)

- Modified from Dewsbury, 2020; uses inspiration from “This I Believe” Essays originally from Edward Murrows of CBS News in the 1950s (see thisibelieve.org).

Example 1: Howard White, basketball player; executive at Nike: thisibelieve.org/essay/48202

Example 2: Sheri White, LGBTQ+ scientist and engineer at Woods Hole Oceanographic Institution: www.npr.org/2009/02/26/101155458/seeing-beyond-our-differences

Your Turn

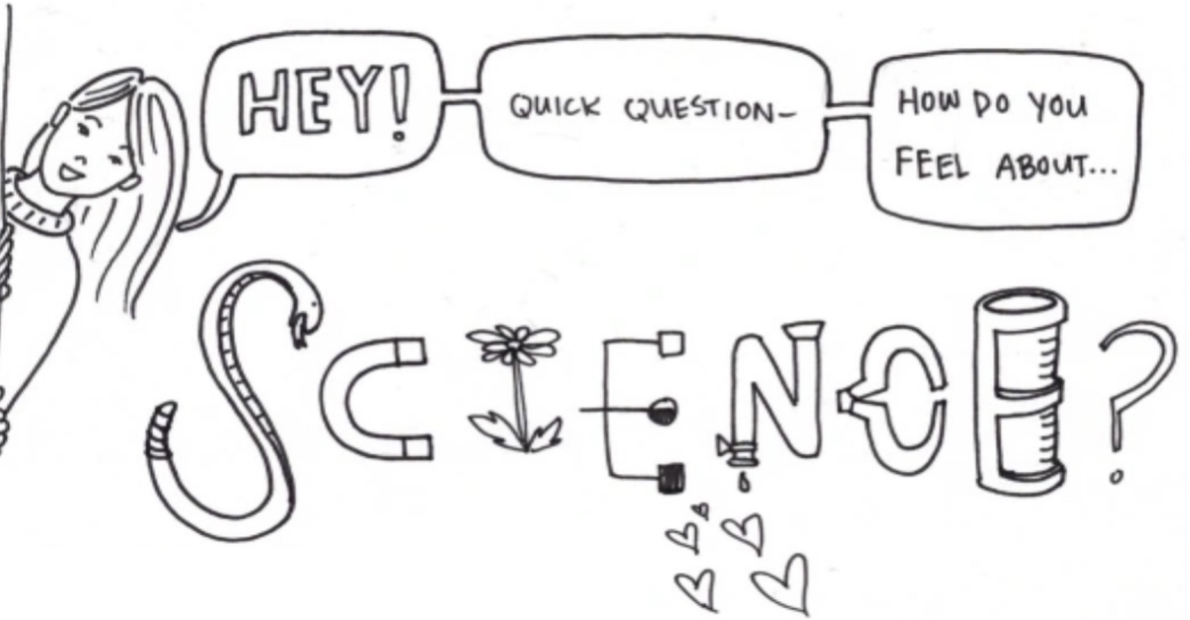
Read Handout and take 2-3 minutes to do your own values affirmation writing reflection

Post-Reflection Questions (Handout)

- What did you learn and/or what questions arose while doing the values reflection writing activity?
- What do you think is the main job of a scientist? Describe 2-3 characteristics of scientists that help scientists succeed.
- Do you think that science is “objective”? Explain.

Activity 2:
Objectivity in Science: Zine Reading and Discussion

- Students question how objective science really is
- Who is conducting research?
- Who is deciding which research gets funded?
- Who benefits or is harmed by the research?
- Deep dive on the importance of diverse perspectives in science and highlights how everyone belongs in science



"The Objectivity of My Affection" Zine:

(Lab 1 Discussion)

Go to: freerads.org/science-scope-ful/

(Read through the "5 main categories of non-neutral parts of science")

Answer the questions on the handout with your group members

Objectivity Zine Questions (Handout)

- What did you learn about what science is/is not?
- Did the info you read change your perspectives about characteristics of a scientist? Explain
- What were similarities/differences in perspectives among your group members?
- How to deal with the challenges that arise when group work involves diverse group members

Activity 3
Undergraduate Research at Barnard College

- Highlight faculty who run research programs that use undergraduate researchers

- Reveal “hidden curriculum” and level the playing field

Activity 3
Undergraduate Research at Barnard College

- Students work in groups (during lab and/or outside of lab) to research one faculty member curated by us

- Answer questions and/or create short presentation
  - Name of assigned faculty member
  - Main research questions
  - Model organism(s) used
  - 1-2 techniques used
  - How many individuals work in their lab? How many are undergrads?
  - Classes taught at Barnard
  - What stood out to your group when you were learning about this scientist?

Activity 4
Scientist Spotlight Presentations

- Project Goal: shift stereotypes about who does science (see Schinske et al, 2017)
- Scientist Spotlight Initiatives Program:
  - run by a group of students, teachers, and scientists who are committed to making the sciences more inclusive by highlighting diverse voices (scientistspotlights.org)
- Other similar initiatives
  - 500 queer scientists (500queerscientists.com)
  - 1000 inspiring black scientists (crosstalk.cell.com/blog/1000-inspiring-black-scientists-in-america)

Activity 4
Scientist Spotlight Presentations

- Students choose one scientist they find interesting
- Instructor approves choice (no repeats; first come, first-served)
- Create 5-minute presentation to be given during lab later in semester:
  - Name, position, institution
  - Why you chose this scientist
  - Summary of the big picture research agenda/goals
  - Primary Data Description: one specific question/hypothesis + technique used to answer the question + data/conclusions from experiments

Wrap-up

- General questions or comments?

Resources and Further Reading

- Dewsbury, B.M. (2020). Deep Teaching in a College STEM Classroom. *Cultural Studies of Science Education*, 15. https://doi.org/10.1007/s11422-018-9891-z

- Harackiewicz JM et al (2014). Closing the social class achievement gap for first-generation students in undergraduate biology. *Journal of Educational Psychology, 106*(2), 375–389. https://doi.org/10.1037/a0034679

- Jordt et al (2017). Values Affirmation Intervention Reduces Achievement Gap between Underrepresented Minority and White Students in Introductory Biology Classes. *CBE Life Sci Educ*; doi: 10.1187/cbe.16-12-0351.

- Miyake et al (2010). Reducing the Gender Achievement Gap in College Science: A Classroom Study of Values Affirmation; *SCIENCE;* 330(6008); DOI: 10.1126/science.1195996

- Schinske et al (2017). Scientist Spotlight Homework Assignments Shift Students' Stereotypes of Scientists and Enhance Science Identity in a Diverse Introductory Science Class; *CBE Life Sci Educ*; https://doi.org/10.1187/cbe.16-01-0002

- Steele, C. M., & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African Americans. *Journal of Personality and Social Psychology, 69*(5) https://doi.org/10.1037/0022-3514.69.5.797

- Turetsky, K.M. et al, (2020) A psychological intervention strengthens students' peer social networks and promotes persistence in STEM. *Sci Adv*, 6(45); doi: 10.1126/sciadv.aba9221