Being Equity-Minded in the Teaching of Mathematics

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PCMI/Teacher Leadership Program
Outline

1. Active Learning and Equity
2. Belongingness
3. Equity-Oriented Habits of Mind
   (applied to various active learning scenarios)
Working Defn of Active Learning

Teaching strategies that reduce classroom time in which students passively receive information and increase the time in which they do, think, predict, discuss, practice, apply, or otherwise engage with course content so as to provide students with opportunities to reflect on their learning and/or receive feedback from other students or an instructor.
Active learning increases student performance in science, engineering, and mathematics

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To test the hypothesis that lecturing maximizes learning and course performance, we metaanalyzed 225 studies that reported data on examination scores or failure rates when comparing student performance in active learning with traditional lecture. The active learning interventions varied widely in intensity and implementation, and included approaches as diverse as occasional group work, active participation in whole-class discussions, and small-group discussion facilitated by professors and graduate teaching assistants. Our metaanalysis showed that active learning interventions were associated with smaller mean decrease in failure rates compared with traditional lecture (Fig. 1B). These results support the claim that active learning is associated with improved student performance.
Getting Under the Hood: How and for Whom Does Increasing Course Structure Work?

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Increased Structure and Active Learning Reduce the Achievement Gap in Introductory Biology

David C. Haak, Janneke HilleRisLambers, Emile Pitre, Scott Freeman
Benefits for Women and Men of Inquiry-Based Learning in College Mathematics: A Multi-Institution Study

Sandra L. Laursen, Marja-Liisa Hassi, Marina Kogan, and Timothy J. Weston

University of Colorado Boulder

Women in non-IBL classes reported statistically much lower gains than their male classmates in several important domains: understanding concepts, thinking and problem-solving, confidence, and positive attitude toward mathematics. In fact, both men and women reported higher learning gains from IBL courses than from non-IBL courses, but traditional teaching approaches did substantial disservice to women in particular, inhibiting their learning and reducing their confidence. These differences for women were independent of their prior mathematics achievement. Women’s spontaneous write-in comments echoed this finding: IBL women wrote...

Overall, it appeared that non-IBL courses tended to reinforce prior achievement patterns, helping the “rich” to get “richer.” In contrast, IBL courses seemed to offer an extra boost to lower-achieving students, especially among pre-service teachers. Yet there was no evidence of harm done to the strongest students. Indeed, high-achieving students may be encouraged by an IBL...
“Equity-minded faculty focus intentionally on the educational outcomes of different groups of students and are able to understand any inequalities in the context of a history of exclusion, discrimination, and educational apartheid. ...”

“Equity-minded faculty see their institution [and themselves] as bearing primary responsibility for eliminating those inequitable outcomes, rather than making students responsible for overcoming ‘deficits’ (lack of knowledge, skills, or qualities). ..."

Equity-Mindedness

“Most importantly, equity-minded individuals are far more likely to understand that the beliefs, expectations, and actions of individuals influence whether minority group students are construed as being capable or incapable.”

1. Think about a student who you perceive to feel a strong sense of belonging in your class. Write about an interaction that you had with them that gives you that perception.

2. Think about a student who you perceive to feel a lack of belonging in your class. Write about an interaction that you had with them that gives you that perception.

(I will not ask you to share these. This is just for you to reflect.)
3. What is one thing you wish students would do more of in your classes to succeed?

4. Now think about the student with a strong sense of belonging from Question #1. Did that student do this thing?

5. Now think about the student with a lack of belonging from Question #2. Did that student do this thing?
Maslow’s Hierarchy of Needs (1943)

- **Physiological**
  - Emotional & Intellectual Safety
  - Belonging to group, classroom, school

- **Safety**
  - Self-concept as learners of mathematics

- **Love/belonging**
  - Belonging to group, classroom, school

- **Esteem**
  - Self-concept as learners of mathematics

- **Self-actualization**

Source: https://commons.wikimedia.org/wiki/File:MaslowsHierarchyOfNeeds.svg
CCSS-M SMPs

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

These Standards for Mathematical Practice are mathematical habits of mind.

Equity-Oriented Habits of Mind

Let’s get in the practice of asking ourselves these questions any time we make instructional choices, big or small:

1. Who is likely to benefit? Who might not?
2. Who might feel included or excluded?
3. How would I know if I need to intervene?
Same Classroom + Different Students = Different Experiences


Context #1: Think-Pair-Share

Please think silently for a moment...
When I ask students to think-pair-share...
1. Who is likely to benefit? Who might not?
2. Who might feel included or excluded?
3. How would I know if I need to intervene?
Please think silently for a moment...
When I ask students to work in small groups on a task...
1. Who is likely to benefit? Who might not?
2. Who might feel included or excluded?
3. How would I know if I need to intervene?
Please think silently for a moment...
When I ask students to work at the board together...
1. Who is likely to benefit? Who might not?
2. Who might feel included or excluded?
3. How would I know if I need to intervene?
Context #3: Open-Ended Projects

Please think silently for a moment...
When I assign open-ended projects to students...
1. Who is likely to benefit? Who might not?
2. Who might feel included or excluded?
3. How would I know if I need to intervene?

https://www.huffingtonpost.com/susan-messina/that-fake-science-fair-poster-that-went-viral-i-made-it-heres-why_b_5053008.html