

# Rehumanizing a math department

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# About me

- Mathematics PhD, Chair of Bates Math Department
- Member of Task Force on Understanding the History of Race and Racism in AMS.
- Number Theorist by day, inclusive pedagogy and equitable practices advocate by night.
- Lived experience as Latinx immigrant (originally from Caracas, Venezuela)
- Creator, former editor-in-chief, and contributor to inclusion/exclusion blog on AMS.

# Definitions

## **JEDI - Justice, Equity, Diversity, and Inclusion**

**Diversity** - through diverse perspectives we learn and create a better science

**Inclusion** - these diverse perspectives have to be heard, valued, and embraced

**Justice** - PEERs (Persons Excluded by Ethnicity or Race) are a product of intentional, structural process reinforced over time. Changing nothing means doing active harm. Requires intentional, long-term, reflective, systems thinking.

**Equity** - Not the same as “equal” or “assimilationist” policy. Equity requires [uncomfortable] centering of PEERs and redistributing resources including time.

# Think together

Why do we care? Why do we think JEDI is important?

Write your thoughts in the chat box.

# Axioms

Federico Ardila's axioms:

- **Axiom 1.** Mathematical potential is distributed equally among different groups, irrespective of geographic, demographic, and economic boundaries.
- **Axiom 2.** Everyone can have joyful, meaningful, and empowering mathematical experiences.
- **Axiom 3.** Mathematics is a powerful, malleable tool that can be shaped and used differently by various communities to serve their needs.
- **Axiom 4.** Every student deserves to be treated with dignity and respect.

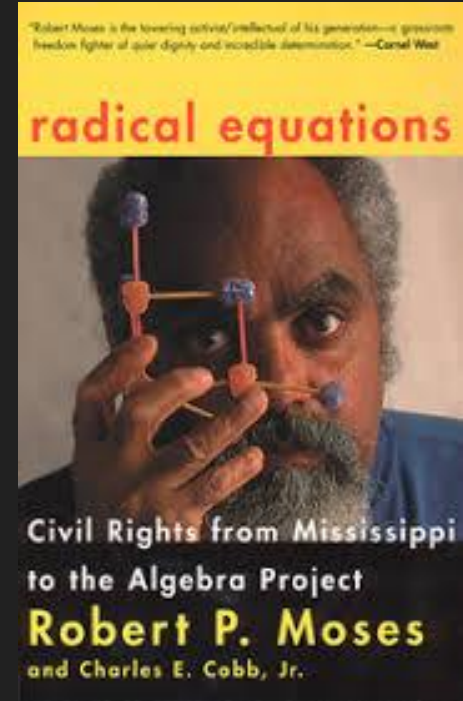
We add: Axiom 5: Math is not neutral



# Math as a right

"If they get these math tools then they will be in positions to demand access to the economic arrangements. These are the tools that are needed by people who are going to come to the table and act on their rights."

"Becoming literate in mathematics is a life-and-death issue for the black community. If we don't get it, we're headed for a new form of serfdom."



# Math as liberation

“[T]he more radical the person is, the more fully he or she enters into reality so that, knowing it better, he or she can transform it. This individual is not afraid to **confront, to listen, to see the world unveiled.** This person is **not afraid to meet the people or to enter into a dialogue with them.** This person does not consider himself or herself the proprietor of history or of all people, or the liberator of the oppressed; but he or she does commit himself or herself, within history, to ght at their side.” (From *Pedagogy of the oppressed*, by Paulo Freire)



## Math as community

"As a classroom community, our capacity to generate excitement is deeply affected by our interest in one another, in hearing one another's voices, in recognizing one another's presence." (From *Teaching to Transgress*, by bell hooks.)





# Math as a human endeavor

"What I hope to convince you of [...] is that the practice of mathematics cultivates virtues that help people flourish. These virtues serve you well no matter what profession you choose. And the movement towards virtue happens through basic human desires: play, beauty, truth, justice, and love." (From *Mathematics for Human Flourishing*, by Francis Su.)

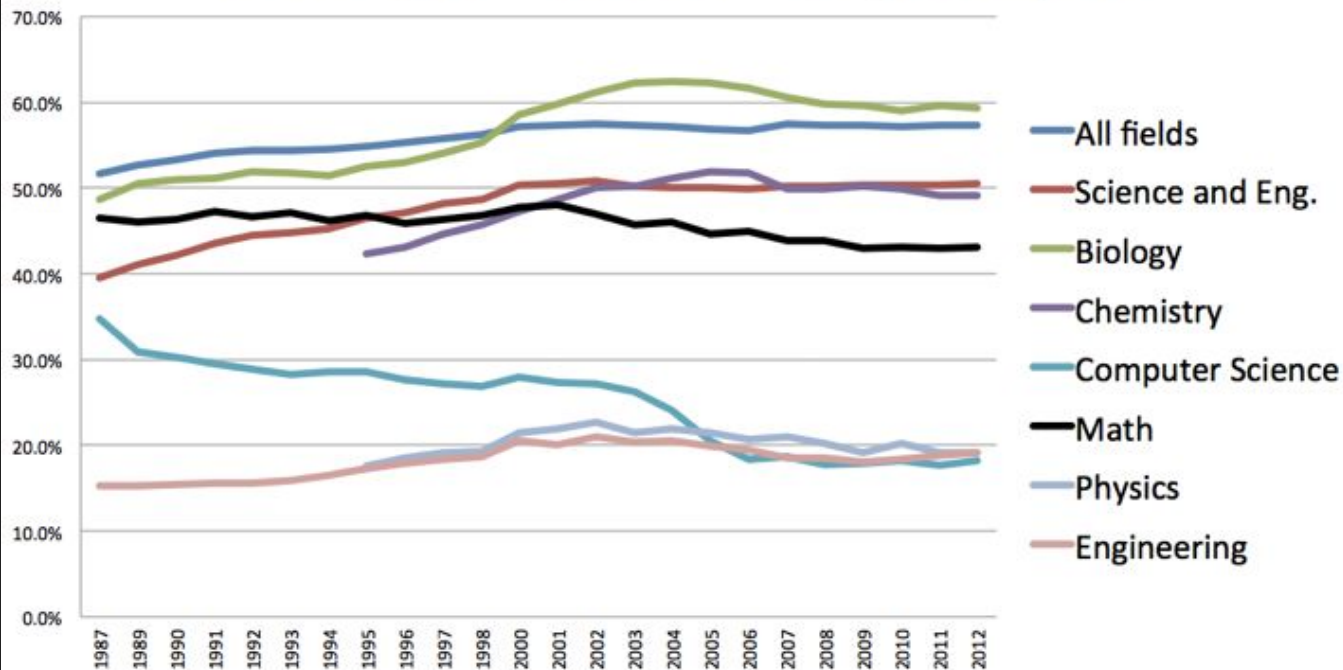


# So where are we now?

If we believe in these axioms and assumptions -- how do we know if we are (or aren't) succeeding?

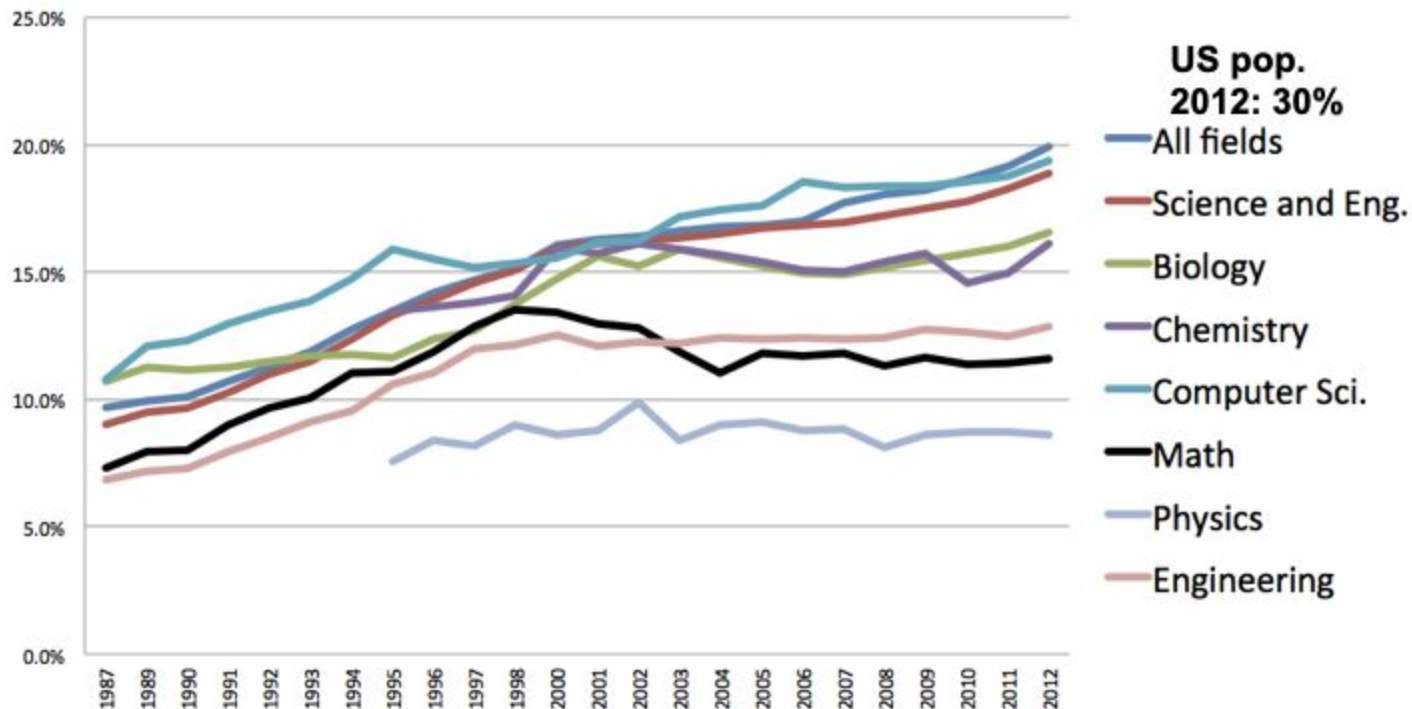
# Women in STEM?

## % of Degrees to Women, By Discipline

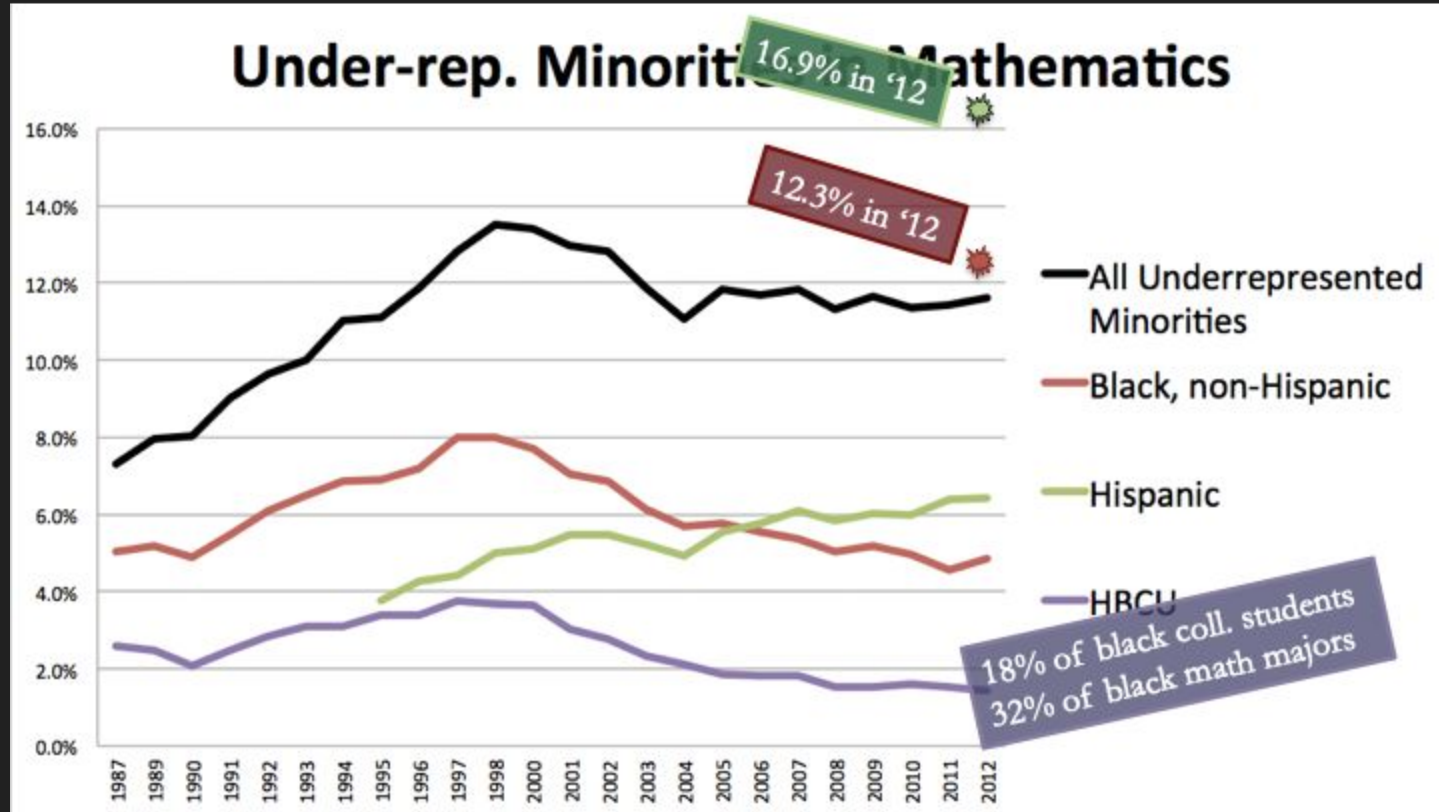


# Minorities in STEM?

## % of Degrees to Under-rep. Minorities

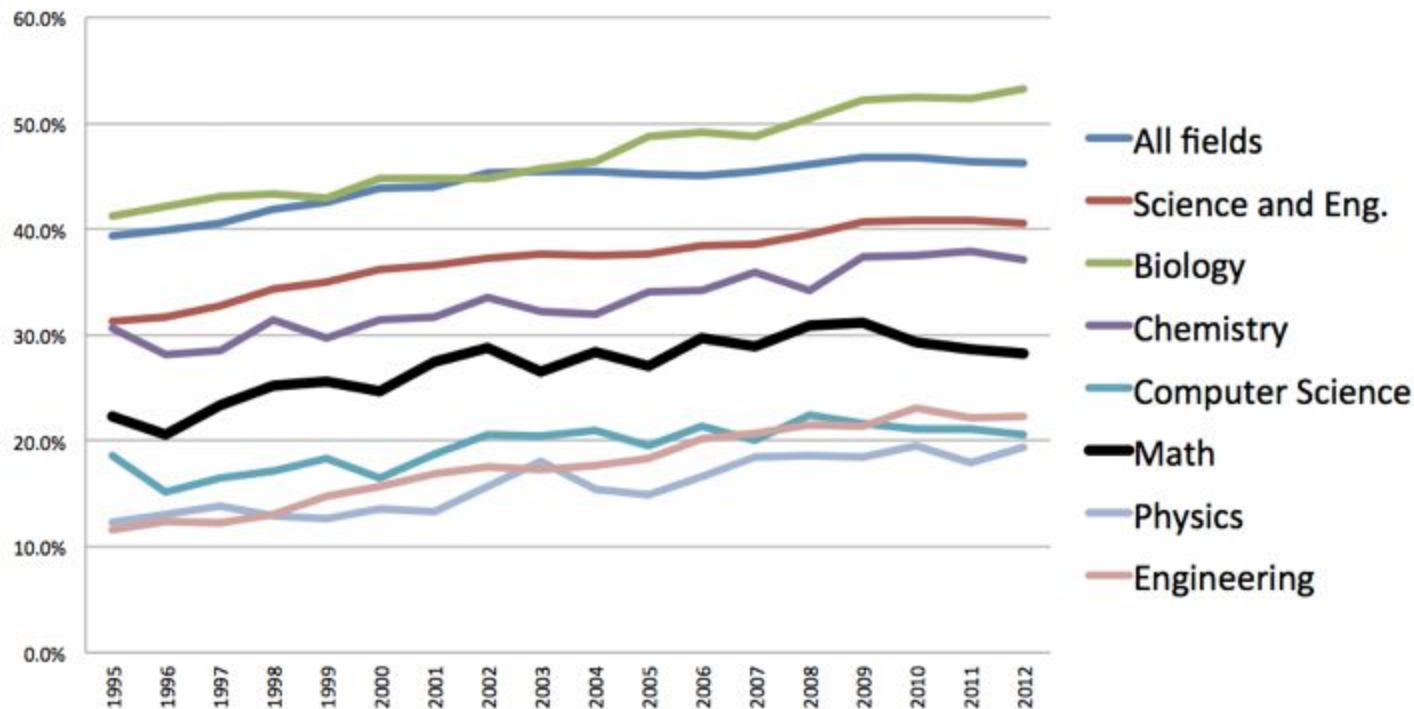


# Minorities in mathematics?



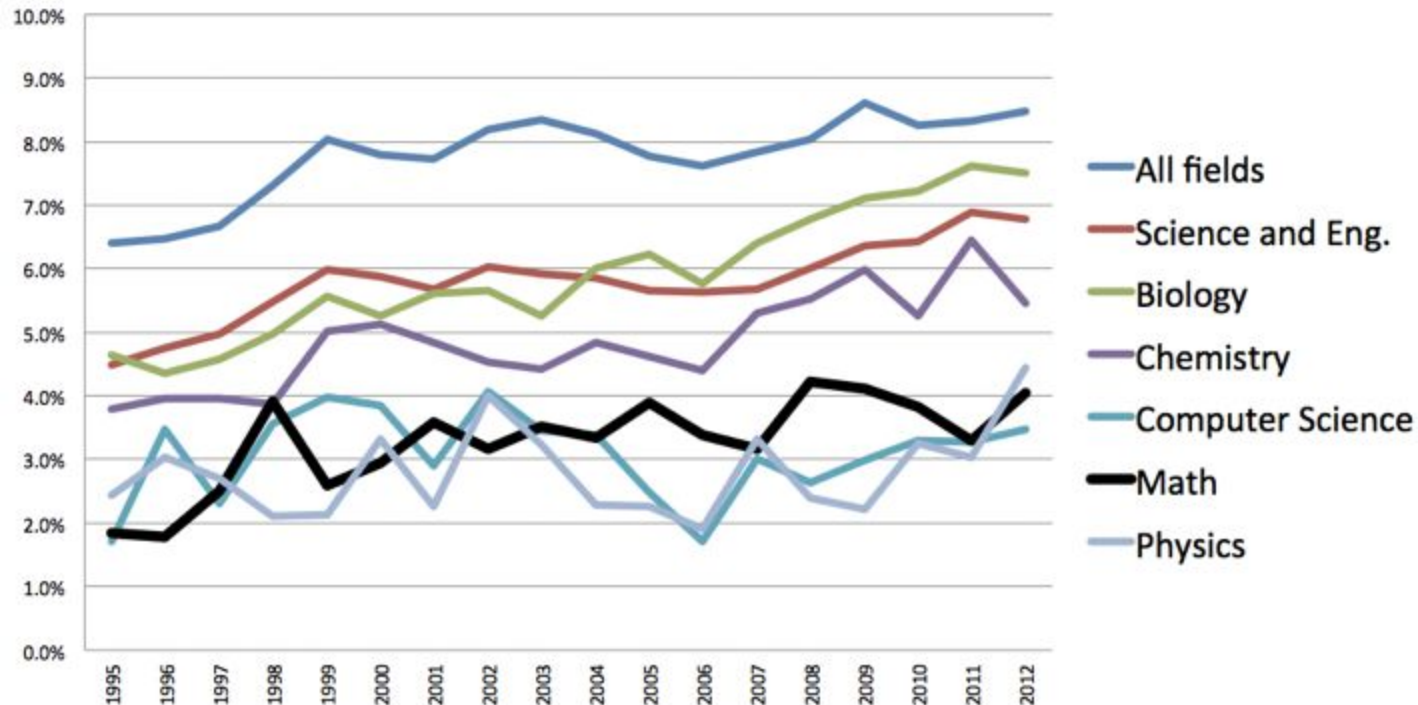
# Worse at ph.d. level – women?

## % Female Doctoral Recipients by Discipline



# Worse for ph.d.'s - minorities?

% Underrep. Doctoral Recip. by Discipline



# Statement of the problem

What do the national data say?

We lose women and BIPOC students in math and the science at every step of the pipeline from middle school through professorships, even when controlling for:

- preparation
- motivation

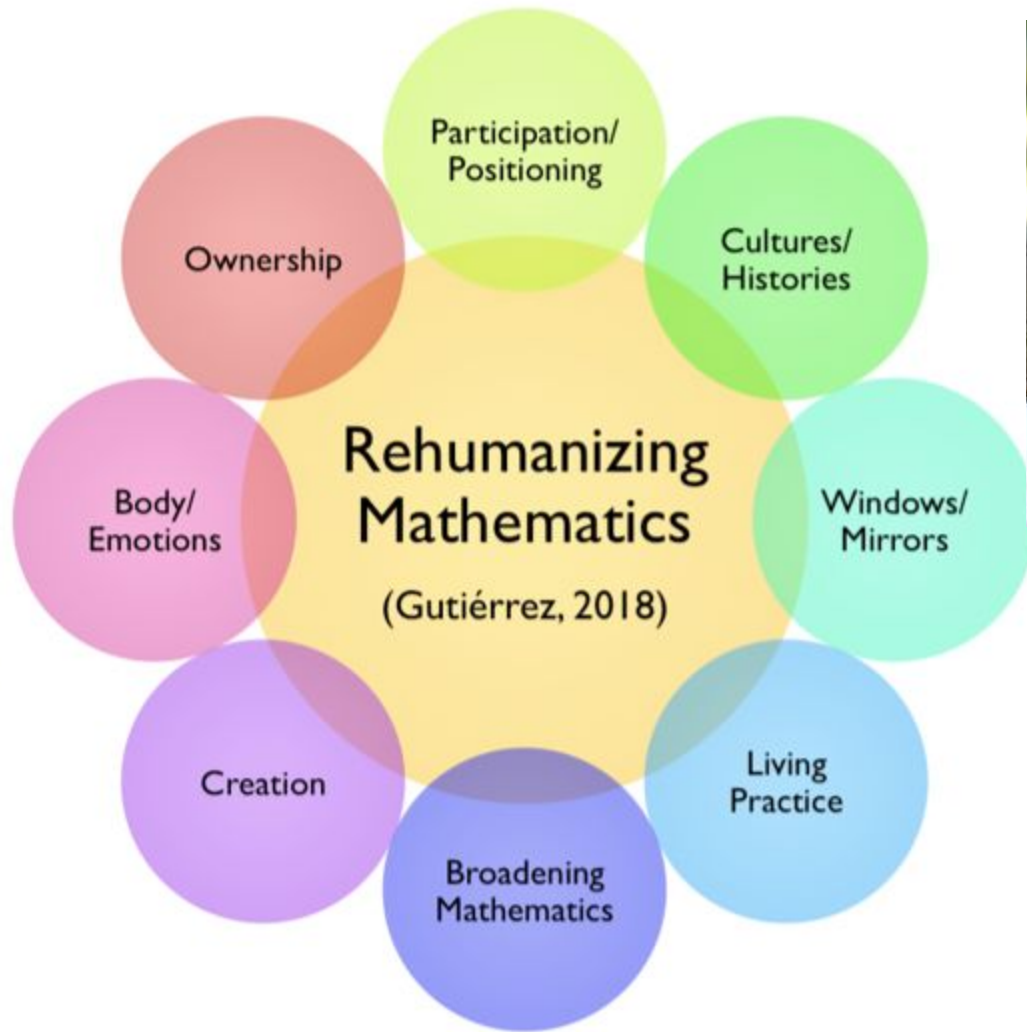
**Our problem isn't the students,  
it's us (STEM communities).**



## Quick exercise

1. Think about one time that you felt excluded in STEM.
2. Why were you excluded?
3. What if you were excluded because of ethnicity and race over time in STEM?
4. What does exclusion of PEER students from mathematics look like in your classroom or in your department?

Add your thoughts to the chat.



See video explanation at  
<https://www.youtube.com/watch?v=D266LYIigS0>

# Dimensions of JEDI

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- Small change in a class (using nametents, playing music)
  - Overhaul of math curriculum (departmental change)
  - College-wide changes into how we do STEM (HHMI Inclusive Excellence grant)

Small alterations (5%) to large overhaul

# Examples of change (5%) Harris and Winger

Creating community - many PEER students want to be in community, and if you are not visibly part of community, how else are you making intentional space?

## Examples

- From Ardila - music (class playlist)
- From Tanner - nameplates with daily post-class reflection

Reference for more ideas:

Tanner, K. Structure Matters: Twenty-One Teaching Strategies to Promote Student Engagement and Cultivate Classroom Equity, CBE-LSE. <https://www.lifescied.org/doi/full/10.1187/cbe.13-06-0115>

# Beware of “cop shit”

- After we went online everyone was worried about “cheating”.
- What are our underlying assumptions?
- Who is most affected by these assumptions?
- Can we shift our perspectives?

Read more:

Moro, J. “Against Cop Shit”, <https://jeffreymoro.com/blog/2020-02-13-against-cop-shit/>

# Beyond 5%

## Analyzing Practices, Asking Questions

“A racist policy is any measure that produces or sustains racial inequity between racial groups. An anti-racist policy is any measure that produces or sustains racial equity between racial groups.” (Ibram X. Kendi)

Racist policies can be *segregationist* (less common), or *assimilationist* (most common). What is a policy in your department that is racist, in Kendi’s language?

- One that affects students.
- One that affects faculty.



# Reflection

How are you being inclusive and how are you being exclusive? (not complements of each other)

Eg. Active learning and study with Estrella Johnson

Reference FMI:

<http://sigmaa.maa.org/rume/crume2019/Papers/37.pdf>

When there is no intentionality, you still harm, because you utilize existing structures that harm. (Dave Kung “Not your fault, but it is your responsibility”)

This is a commitment, not a one-off fix. Why we have learning communities.

# Changing policy - faculty (5%)

## Hiring practices:

- Where are you advertising? (NAM, SACNAS, AWM have hirings ads)
- The value of rubrics
- Diversity statements -- who are they for?
- Have a mentoring plan in mind

Fine, E. & Handelsman, J. Searching for Excellence & Diversity: A Guide for Search Committees, National Ed., WISELI, 2012. <https://www.amazon.com/Searching-Excellence-Diversity-Committees-National/dp/0615711782>

Department meetings -- who gets to speak? How are decisions made?



# Going beyond 5% - Reflection

Reflection and professional development is important to the journey.

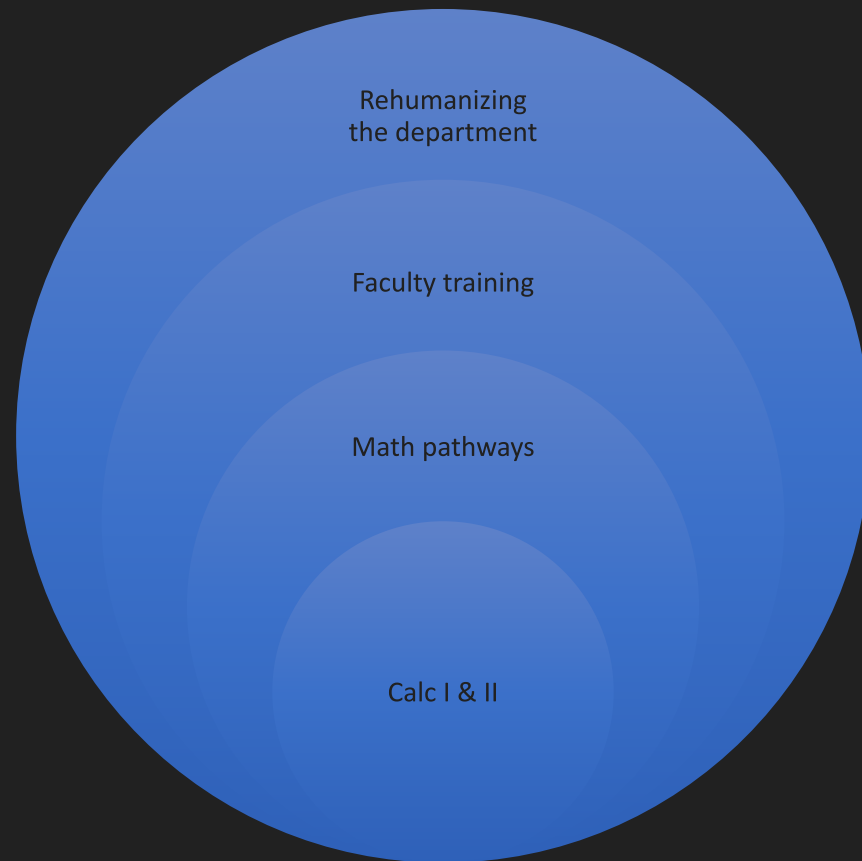
- How are you being inclusive and how are you being exclusive?
- What are the barriers to your success in achieving a safe and welcome environment for a diverse community in your department?
- ^^ What are the structures that prop these barriers? (Mathematicians see patterns, analyze system structures - we should be good at this!)

Approach: Think of one thing you could implement right now. One thing that you'd like to reconsider and/or implement long term.

## Example: Rehumanizing the Bates math department

- **Big goal:** Lead my department in changing the mathematics program to be one where math interested students and faculty can thrive, especially critical for students/faculty from minoritized groups.
- **Medium goal:** engage my colleagues in conversation around equity, inclusion, and rehumanizing mathematics. In particular, read together Rochelle's "Rehumanizing mathematics" and try to apply it to our department.
- **Smaller goal:** I want to start by redesigning the Calc I & II sequence.

# GOALS



# Rehumanizing Mathematics Dimensions (Calculus I & II as a start)

- Participation/Positioning → Focus on active learning.
- Cultures/Histories → Center mathematicians of color by profiling specific people.
- Windows/Mirrors → team work.
- Living Practice → Authentic research projects using real data.
- Broadening Maths → Reflection piece on own thinking (metacognition) and community engaged learning.
- Creation → Students present/create own problems for optimization and related rates pieces, e.g.
- Body/Emotions → continued reflection, class presentations require movement, using manipulatives in class.
- Ownership → Active learning leads to this naturally.

# Overview of Project

- Change the curriculum so that it is less exclusionary (i.e. think of different pathways, course offerings, etc).
- Train faculty in issues of racial equity.
- Change our pedagogy so that students can thrive (inclusive pedagogy, alternative assessments, rehumanizing the classroom). Use the Calc I & II redesign (and data collection) as a model -- not necessarily prescriptive (“you should do it exactly this way”) but as an example of what can be done (“this is something that has worked, and this is why”).

# What Will Convince Me/Others I'm Rehumanizing My Space?

- We can see math and STEM-interested students persist and succeed in the programs and departments of their choosing.
- Affective gains: students feeling belongingness and self-efficacy
- Collecting data on the calculus classes specifically might be a good way to start with evaluating the success of modifying introductory courses. Also, it is important to be aware that these changes take some time to really stabilize, so being forgiving at the beginning stages is really important.

# What's next

- Data collection
- Expanding to more courses
- Continuing to learn!
- Rehumanizing is a process -- requires constant vigilance and reflection.

Thank You!