

CRITICAL CONVERSATION INTO ACTION: FOSTERING STUDENTS' MATHEMATICAL IDENTITIES



EquiLearn Virtual Roundtable

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IUPUI

SCHOOL OF EDUCATION

INDIANA UNIVERSITY
Indianapolis

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COMMITMENTS

Stay engaged

Speak your truth

Experience discomfort

Expect and accept non-closure

(Singleton & Linton, 2006)

WELCOME



This virtual roundtable is interactive - join the discussion live via the chat feature

To reduce noise distractions, we ask participants to mute their microphones when not speaking



A recording of this virtual roundtable and accompanying materials will be posted to greatlakesequity.org

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ANTICIPATED OUTCOMES

- Participants will learn/revisit/discuss productive mathematical beliefs about students' learning.
- Participants will learn/discuss how to foster equitable learning environments that affirm learners' mathematical identities (i.e., encourage students to see themselves as problem solvers capable of making valuable contributions to mathematics and validate students' knowledge and lived experiences as learners) and leverage multiple mathematics competencies.
- Participants will reflect on how current mathematical environments can be strengthened to further promote equitable learning for all students.

EDUCATIONAL EQUITY

Educational equity means that every student has access to the educational resources and rigor they need at the right moment in their education across race, gender, ethnicity, language, disability, sexual orientation, family background and/or family income.

(The Aspen Education & Society Program and the Council of Chief State School Officers, 2017)

UNFOUNDED PREDICTIONS ARE INEQUITABLE

Equity means “being unable to predict students’ mathematics achievement and participation based solely upon characteristics such as race, class, ethnicity, sex, beliefs, and proficiency in the dominant language”

(Gutiérrez, 2007)

Why must educators not “predict” what students are capable of?

Take a minute to write your thoughts in the chat box and send your response to all participants.

GROWTH vs. FIXED MINDSETS

Students with a 'growth mindset' believe that intelligence and 'smartness' can be learned.

- Students with a growth mindset work and learn more effectively, displaying a desire for challenge and resilience in the face of failure.

Students with a 'fixed mindset' believe that you are either smart or you are not.

- When students with a fixed mindset fail or make a mistake, they believe that they are just not smart and give up.

(Boaler, 2013; Dweck, 2006)

HARMFUL ASSUMPTIONS

Based on some nonacademic characteristic, I can prejudge your mathematical aptitude.

Based on your grade, I can prejudge your mathematical promise.

Low-performing students must be incapable or lazy.

Mathematical teaching doesn't involve culture.

I'm doing a student a favor by telling him or her to leave math.

Only some people are "math people."

There are "low kids" and "high kids."

Math is not political.

(Su, 2015-2016)

THE POINT OF INTERRUPTION

We have the power to increase access and success for students in nontraditional programs by interrupting the cycle of negative micromessages, bolstering student self-efficacy, and challenging cultural stereotypes.

(The National Alliance for Partnerships in Equity [NAPE], n.d.)

MICROMESSAGES

Micro-inequities

Excluded

Devalued

Unintentional

Negative

Discouraged

Micro-affirmations

Valued

Included

Encouraged

Intentional

Positive

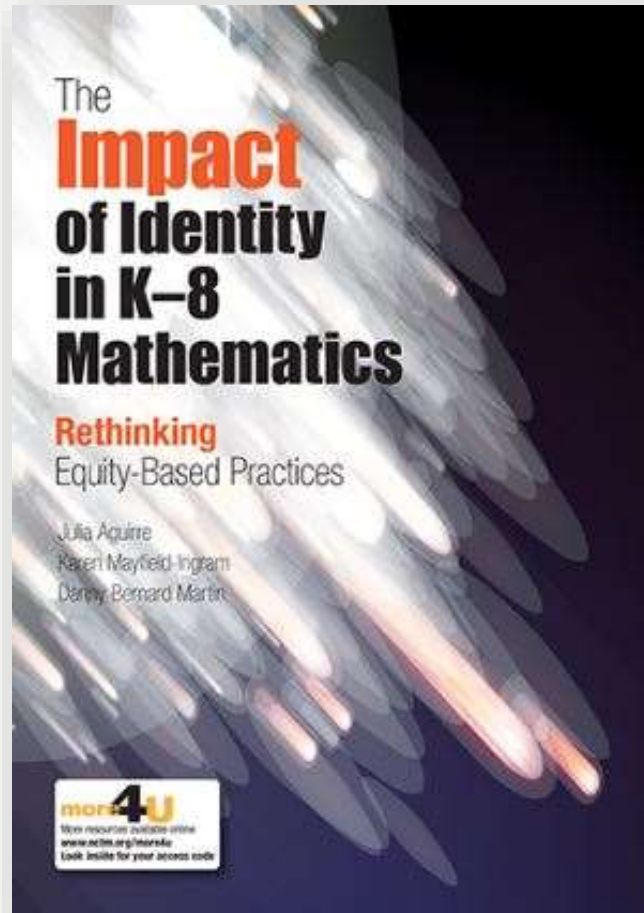
(National Alliance for Partnerships in Equity, 2015)

MICROMESSAGES (cont.)

- **Cultural stereotypes** exist about people and careers.
- Because of **stereotypes**, we have **implicit biases**.
- **Micromessages** are the manifestation of **implicit biases**.
- Positive and negative **micromessages** accumulate.
- Causes **high or low self-efficacy**.
- Behavior is the result of **self-efficacy**.

(National Alliance for Partnerships in Equity, 2015)

STUDENTS' MATHEMATICS IDENTITIES



...are how students see themselves and how they are seen by others, including teachers, parents, and peers, as doers of mathematics.

(Aquirre, Mayfield-Ingram, & Martin, 2013)

MATHEMATICS IDENTITY

**Mathematics
Identity
Includes:**

Beliefs about one's self as a mathematics learner

One's perceptions of how others perceive him or her as a mathematics learner

Beliefs about the nature of mathematics

Engagement in mathematics

Perception of self as a potential participant in mathematics

(Solomon, 2009)

Examine Cases: Calvin, Caroline And Craig



Toolkit



- How would you characterize each student's mathematics identity?
- What factors are impacting each student's identity?
- What can a teacher do to strengthen each student's mathematics identity?

Take 5 minutes to read the cases, answer the questions in the chat box, and send your response to all participants.

IDENTITY AFFIRMING AGENCY



- Teachers affirm mathematics identities by providing opportunities for students to **make sense of and persevere in challenging mathematics.**
- Students engage with mathematics that **requires active participation, asking questions, problem posing, and reasoning.**
- This form of participation builds a **high sense of agency in students.**

(National Council of Teachers of Mathematics, Principles to Action Tool Kit, 2015)

CATALYZING CHANGE IN HIGH SCHOOL MATHEMATICS: INITIATING CRITICAL CONVERSATIONS

- **Key Recommendations**

- Each and every student should learn the Essential Concepts in order to expand professional opportunities, understand and critique the world, and experience the joy, wonder, and beauty of mathematics.
- High school mathematics should discontinue the practice of tracking teachers as well as the practice of tracking students into qualitatively different or dead-end course pathways.
- Classroom instruction should be consistent with research-informed and equitable teaching practices.
- High schools should offer continuous four-year mathematics pathways with all students studying mathematics each year, including two to three years of mathematics in a common shared pathway focusing on the Essential Concepts, to ensure the highest-quality mathematics education for all students.

(National Council of Teachers of Mathematics, 2018)

DRIVING WHILE BLACK OR BROWN

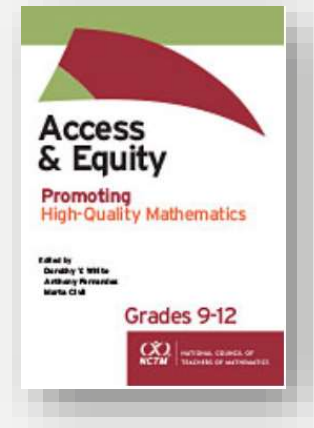
Students were encouraged to use statistics related to racial profiling to determine whether injustices had occurred and then suggest what steps should be taken next.

Information related to the Task

This is a sample of Illinois data based on police reports from 1987-1997. In an area of about 1,000,000 motorists, approximately 28,000 were Latinx. Over a certain period of time, state police made 14,750 discretionary traffic stops (e.g. if a driver changes lanes without signaling, or drives 1-5 mph over the speed limit, police may stop the driver but do not have to). Of these stops 3,100 were of Latino/a drivers.

(Gutstein, 2006)

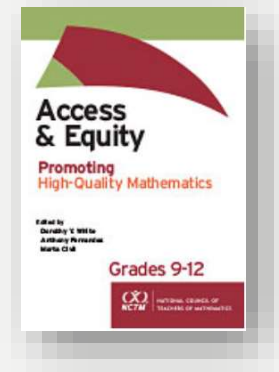
DISABILITY, ACCESSIBILITY, AND THE PYTHAGOREAN THEOREM: ONE TEACHER'S APPROACH TO TEACHING FOR EQUITY AND SOCIAL JUSTICE



- **Tasks and questions given to students:**
 - Write down everything you know about the Pythagorean theorem.
 - Define disability.
 - Define accessibility.
 - How can we increase accessibility at our school?
 - How many students come to our school in a wheelchair?
 - How is the Pythagorean Theorem useful in everyday life?
- **Developed into a social justice lesson related to disabilities and access**

(Maloney et al., 2018)

DOUBLE PERIODS



- Students developed a statistical question and gathered data, which suggested inequities in course enrollment by race/ethnicity.
- The question was personally meaningful to many students, as their teacher had provided opportunities for students who were not on the “honors” track but who had good grades in ninth-grade Algebra I to accelerate their course taking so that they could enroll in AP statistics.
- While some members of the class were initially taken aback by the implication that race/ethnicity may play a role in course taking, the personal experiences of these non-“honors” students helped to frame the class’ discourse about causes for the inequity in course taking as being largely about opportunity to learn rather than ability or interest.
- Students’ use of mathematics and data empowered them to inform the principal of the school of their findings and start making changes in their school culture.

(Conway et al. 2018)

SOCIAL JUSTICE LESSON

Goals for Students:

Sociopolitical consciousness

An awareness of the social, political, economic, historical, and cultural contexts of their lives, society, and world.

A sense of social agency

A view of themselves as people able to effect change in the world.

Positive cultural and social identities

Youth who are strongly rooted in their home languages and cultures; and have the confidence and capacities to stand up for that which they believe.

(Gutstein, 2006)

TERRICA

Terrica, an African American female senior who was hesitant about taking AP Calculus, successfully presented a complex mathematical topic that had not been covered in her course to her peers at the end of the semester with poise and confidence. According to Frank and Hickson (2018), students like Terrica were often overlooked when teachers were selecting students to move on to AP Calculus, a course that many students saw as only meant for a few “math whizzes” in their school (p. 78). Terrica’s teacher, Mrs. Hickson, had talked Terrica into taking the class because Terrica had always demonstrated a keen ability to think critically about complex mathematical topics even though her grades did not reflect this. Mrs. Hickson knew that Terrica would be successful with the right support.

(Frank & Hickson, 2018)

According to Nasir (2002), the relationship between learning and identity is bidirectional, with access to learning supporting stronger identities, and identity, in turn, supporting learning.

(Nasir, 2002)

8 MATHEMATICS TEACHING PRACTICES

- Establish mathematics goals to focus learning.
- Implement tasks that promote reasoning and problem solving.
- Use and connect mathematical representations.
- Facilitate meaningful mathematical discourse.
- Pose purposeful questions.
- Build procedural fluency from conceptual understanding.
- Support productive struggle in learning mathematics.
- Elicit and use evidence of student thinking.

(National Council of Teachers of Mathematics, 2014)

5 EQUITY BASED TEACHING PRACTICES

- Go deep with Mathematics.
- Leveraging multiple mathematical competencies.
- Affirm mathematics identities.
- Challenge spaces of marginality (students' experiences and knowledge are legitimate).
- Draw on multiple resources of knowledge (math, language, culture, family, etc.).

(Aguirre, et al., 2013)

SOCIAL JUSTICE GOALS

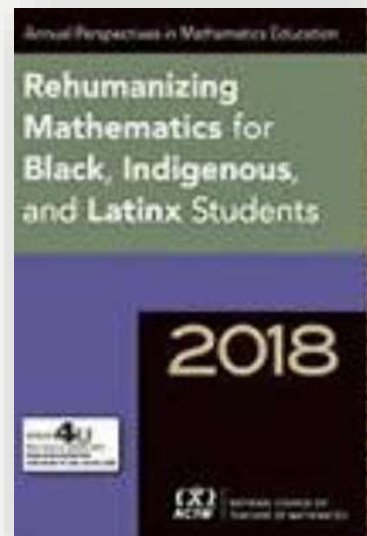
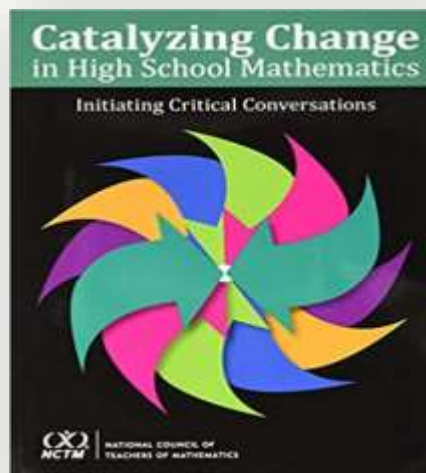
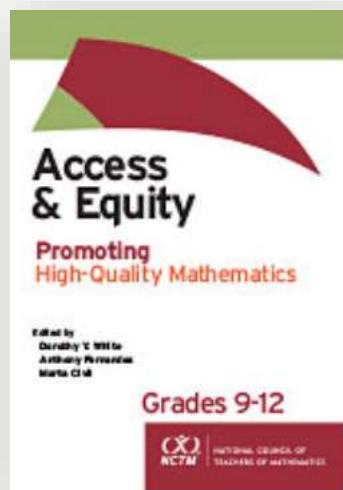
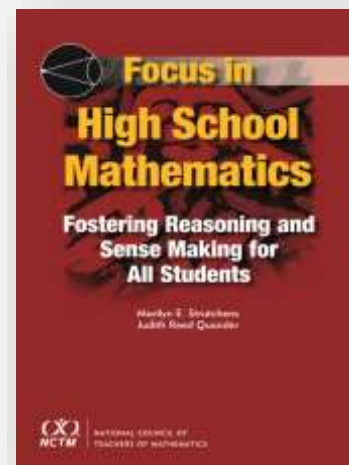
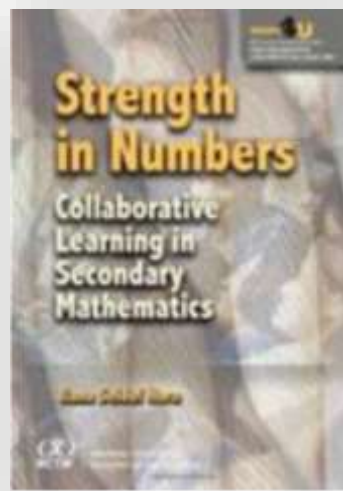
- Start slowly and be patient with yourself and students.
- Engage students in critical mathematics through a pedagogy of questioning.
- Incorporate students' life experiences directly into the curriculum.
- See and encourage students to see mathematics in life daily.
- Help students to develop sociopolitical consciousness.
- Facilitate student's development of mathematical power (as defined by NCTM (2000)).
- Use problems that motivate students to study and use mathematics.
- Cultivate students' development of a sense of agency.

(Gutstein, 2006, 2012)

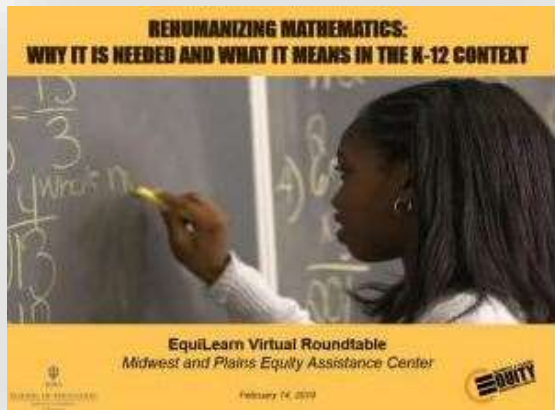
QUESTION TO CONSIDER...

- ✓ Based on what you've heard today, what is one action step you can immediately take to make your classroom more equitable and empowering?
- ✓ What are the results of having high expectations for all students?
- ✓ How can we eradicate harmful assumptions that impede students' learning in our school buildings and districts?

RESOURCES

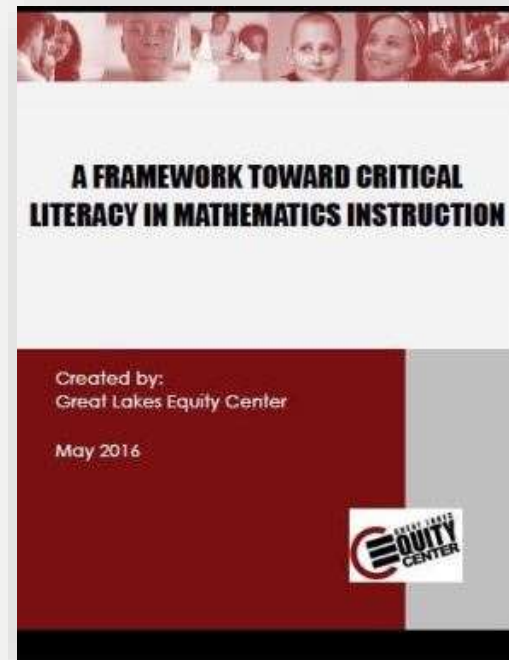


MAP CENTER RESOURCES



Rehumanizing Mathematics:
Why it is Needed and What it Means in the K-12 Context

Within The Intersection:
What Does It Mean to Be
Black and A Young Woman
in Mathematics Classrooms?



A Framework Toward Critical Literacy in Mathematics
Instruction

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