Underrepresented Students' Conceptualizations of Mathematical Capabilities

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Jamila Brandon, Rebecca Adler & Bethany Rittle-Johnson
Vanderbilt University

Background/Introduction

- Many urban schools struggle with formatting a straight path into higher education.
- Between second grade and freshman year of high school, students form an impression about school (Ages and Stages Development, 2019).
- Many minority students tend to develop a disdain for math, creating a negative math identity.
- Minority voices are not always heard

Study Aims

This study will look further into student math identities as they
matriculate through school, This study is significant because it explores both positive and negative math identities

Methods

Participants:

- 251 Highschool students (56% female)
- **Math Course**
  - ¼ of students participating were in advanced math courses
  - Remaining students were enrolled in general math courses
- **Race of students**
  - 81% Black
  - 8% Hispanic
  - 6% White, non-Hispanic,
  - 4% other

Procedure

- Focus groups were held in the Fall of 2019
- Small groups of 3-5 students met at their school with one facilitator
- Groups were based on enrollment in advanced vs. general math courses
- Focus groups lasted about 30 minutes after school
- Focus groups were conducted by one of five women, four who identify as White and one who identifies as Black.

Questions

Q3i. Are you good at math? How do you know?

Q3ii. How do you know who is good at math in your math class? Follow-up: How does someone get good at math?

Q3iii. Think about people who are good at math outside of school. How can you tell they are good at math?

Codes

Codes for question 3i&3ii

1. **Performance**: *"ability to perform in mathematics" (from Cribbs et al 2015)*
2. ***Competence (understanding)*** "ability to understand mathematics"
3. ***Interest*** (Interest or enjoyment): "desire or curiosity to think about and learn mathematics" (from Cribbs et al 2015)
4. ***Recognition*** *"How students perceive others to view them in relation to mathematics"*
5. ***Growth mindset*** - (Degol) et al 2018. Is math ability something that is fixed/cannot be changed, or can math ability shift with time?

Codes for question 3iii

1. **Performance:** Accuracy and/or speed at calculating, can calculate mentally
2. **Competence**
3. **Interest** (interest or enjoyment)

Results

Code	Sample quote from past or current research	% of Groups Mentioned Theme for Self	% of Groups Mentioned Theme for Class
x. Good at math	n/a	n/a	n/a
x.a Yes	"…I realized I was good at math" Berry 2008 p. 475	79.1	n/a
x.b Mixed	"Well I'm doing OK" Boaler p. 301	61.2	n/a
x.c No	"I'm no good at maths now" Boaler p. XXX	47.8	n/a
1. Performance	n/a	71.6	70.8
1a. Grades or accuracy	""I can do well on math exams." Cribbs et al	68.7	52.3
1b. Speed	"…at my table I'm always the first, and like my other partners are like, 'What's the answer? How'd you get that?'" Usher, 2009 p. 294	7.5	36.9
1c. Placement	"My third-grade teacher divided the class into groups and I was with the group that got the harder problems. This made me feel like I was smart." Berry 2008, p. 473	1.5	7.7
2. Competence	n/a	92.5	86.2
2d. Ease of learning	"math always comes easy to me more than any other thing." Usher, 2009,	71.6	10.8

Results

- Most common code for students who were not good at math was poor understanding and/or lack of ease of learning
- When discussing their classmates math capabilities students referred to participation
- When discussing people outside of school, majority of groups also discussed performance and competence
- **Gender differences in Black Students' Beliefs in General Math Courses.**
  - Groups of Black young women contained at least one student from each group who had a negative self-concept, while only one group of Black young men had a negative self-concept
  - Poor understanding was also used to justify their negative self-concept.
  - Black young men and women mentioned performance and competence, while also mentioning grades/accuracy and ease of learning.
  - Black young women also frequently mentioned understanding and interest, which were not mentioned by Black young men in justifying their positive math capabilities.
  - Interest was rarely mentioned in the full sample or among Black young men, but a substantial minority of groups of Black young women (43%) mentioned interest
- **Students' Beliefs in Advanced Math Courses**
  - Compared to students in general courses, advanced math student groups mentioned that they were good at math at similar rates. But were less likely to mention that they were bad at math (35.3% vs. 52).
  - When talking about their classmates' math capabilities, students in advanced math classes most often referred to accuracy/grades
  - They also mentioned their classmates' understanding more often than students in the general math courses.
  - advanced math groups were somewhat more likely to mention performance and one's ability to use non-money-related math in work and daily tasks.

Discussion

- In the future this study can help teachers to understand how their students are feeling and interpreting their math skills.
- Future research should find ways we can better help our minority students.
- Schools should create a safe learning environment for students especially children of color to ask questions and receive constructive help
- Teachers should find ways to make their classes more engaging and interesting for students across all demographics.
- Teachers should find a ways to give all students positive recognition