

Studying Successful Doctoral Students in Mathematics from Underrepresented Groups

Critical Issues in Mathematics Education 2023: Mentoring for Equity
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Education
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Today's talk draws on an NSF CORE

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- **The anonymous, generous, brilliant students who have trusted us - not just the CORE team, but all of us in mathematics - with their stories so that math departments can create real and lasting change.**

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Spoiler Alert

To begin to meet students' needs:

1. Talk with students individually, one on one.
2. Talk with faculty who are already doing #1, and draw on collaborative teams to support students.
3. Put yourself in situations where you can hear from students and faculty from historically marginalized groups.

Implications for recruiting, mentoring, and providing support emerge from the research, but can also emerge from those conversations.

Plan for the hour

General plan:

1. Context and background.
2. General themes that emerge from the interviews.
3. What students say about mentoring:
 - a. Ideal mentors
 - b. Real mentoring experiences
4. Time for Q & A. (Feel free to ask questions throughout!)

We'll share quotations from the students' interviews, and give people time to read those.

The CORE

- Context: in 2018, among the US citizens earning math PhDs, *fewer* than 100 were students across all underrepresented racial groups; fewer than 1.5% were Black students (Golbeck et al., 2019).
- The project has conducted in-depth, semi-structured interviews with **75** successful doctoral students/recent PhDs from underrepresented groups.
- Goal: to understand **students' perspectives** on the **environments and structures** that support students' success. The goal is *not* to understand characteristics of individual students who succeed.

Research questions

RQ1: What are lived experiences of successful underrepresented students who are pursuing mathematics PhDs?

RQ2: From the perspectives of students and recent PhDs from underrepresented groups, what formal and informal structures are effective in supporting mathematics doctoral students?

What do we mean by “successful”?

We define success at four stages:

- Newly accepted doctoral students and post-baccalaureate students who have successfully navigated undergraduate degrees and the application process
- Early graduate students (pre-qualifying exams) who have successfully navigated the transition to graduate school in mathematics
- Advanced graduate students who have passed all exams and are working on dissertations
- Recent PhDs (0-5 years post graduation) in academic and non-academic jobs.

Participant sample

Race/ethnicity

- Black / African American: 38
- Latinx: 26
- Multiracial/other: 8

Gender

- Female: 35
- Male: 37

Of those who mentioned programs

- 22 attended REUs
- 6 did not attend REUs
- 4 attended bridge programs
- 8 attended EDGE
- 3 attended post-baccalaureate programs

Participant sample

	Current / most recent graduate school			Current / most recent undergraduate school		
Type	Public: 48	Private: 16		Public: 41	Private: 17	
Size	Large: 53	Medium: 10	Small: 1	Large: 36	Medium: 8	Small: 14
Designation	PWI: 48	Any MSI: 16		PWI: 30	Any MSI: 28	

Sample Interview Questions

Getting to know the interviewee: What does success in graduate school mean to you?

Mentorship: Do you have mentors? How do they support you? Describe your ideal mentor.

Academics: Can you tell me about your school's qualifying exam structure?

Practical needs: How did money play a role in choosing your university?

Race: How do you think race has played a role in your experience?

Network: What is your connection to the larger community of mathematicians of color?

Finally: What are the systemic issues that aren't being addressed that should be?

Broad emerging themes

- Isolation and invisibility
- Role of social capital and access/lack of access to:
 - Opportunities
 - Networks
 - Formal and informal information about navigating graduate school
- Role of finances as a support or barrier to success
- The power of mentorship and support

Isolation/invisibility

Students report experiencing:

- Being the only minoritized person in the department
- Being “clumped” with other minoritized students, rather than being recognized and treated as individuals
- Being treated as invisible or unimportant
- Lack of cultural knowledge in their departments
- Not being able to share their experience
- Lack of access to knowledge about pathways through graduate school and beyond
- Invisible extra pressure to succeed

In our data set, an overwhelming majority of participants describe at least one experience in which they felt isolated in their department because of their race or ethnicity; the nature of those experiences varies widely.

Student Voices: Isolation/Invisibility

I sat at the front of the room ... And I just remember that [the professor] never once made eye contact with me. And there were a couple of times when I like raised my hand and it seemed like he totally didn't even see that I was raising it and I was just like, okay, lower that back down, I guess. ...

I'm like, does anyone else see me raising my hand? Am I a ghost right now? Yeah.

Student Voices: Isolation/Invisibility

But for example, my department, **I think they clump us [minoritized students] all together** and forget that we might need different things. So I think part of the issues I have with my department - even though they had very good intentions - they didn't really spend the time to look at the layers of what it means to be a minority student. It's like, "Okay, you're all minorities. This is what you only need." Instead of, "Well, depending on who you are, you need just different things."

Student Voices: Isolation/Invisibility

There was always a constant: me being approached like, "Why [are you] here? Why did you get this funding? How did you get [here]?" Oh, just all the very aggressive comments. And those are just things that they just discourage minority women from moving forward, I mean just the fact that someone even feels enough nerve to even form those questions is just not cool that they feel comfortable and don't think that it's crazy, yeah...

Social capital

Students' stories illustrate:

- Communication is make-or-break
 - Confusion about the official and unofficial paths through graduate school
 - Breakdowns in communication about classes, teaching, requirements
 - Students' needs are often not well understood, and thus go unmet
- The critical importance of networks
 - Inside their department and university
 - In the larger mathematical community
 - In the community of mathematicians from historically marginalized groups
- More generally: the critical importance of social capital

In our data set, *every* student's stories of success involve social capital in some way (ae).

Student Voices: Social Capital

And I ran into my old advisor from [undergraduate school] several years prior. And so I ran into her [on a city bus], and she had asked me...She's like, "Oh my God, [Interviewee], how've you been, what are you doing?"....because when I left, she had found out that I had left, and she said, "I wish you had reached me earlier, I could have helped you. You had this mess." ... And she's like, "well, have you ever called [community college]?"

[This chance encounter was the first step in a pathway to graduate school.]

Actual capital (money)

Students navigate financial aspects of transitions from college to graduate school.

- Many white graduate students in mathematics have financial safety nets (and so do some of the students in our data set).
- Without that safety net, the structure, timing, and amounts of pay are very important and can derail transitions - starting school, passing qualifying exams, getting jobs.
- Students may need support in figuring out who and what to ask about salary and payment.

Help student navigate other practical issues around transitions. Find out what students need!

Mentorship

Mentors are powerful.

- This is *everywhere* in the data: *we don't know when students need support, or what they need.*
- Not hearing from students doesn't mean they are "fine."
- Students report
 - not wanting to be a burden
 - not knowing what questions to ask
 - feeling lost at different stages, especially in times of transition
 - what unfolds when a mentor has their back
 - what unfolds when a mentor ... does not have their back

Ideal Mentors

Students offered extensive details about their ideal mentors:

- Students frequently describe themselves before describing their ideal mentors.
- Students described a core of “care and intentionality,” even if that manifests differently in different relationships.
- Trust emerges in multiple ways. An ideal mentor:
 - Understands the student’s personal identity and life context.
 - Offers a safe space for questions of all kinds.
 - Cheers on progress but does not judge setbacks.
 - Speaks truthfully and directly but not unkindly or unduly critically.
 - Identifies opportunities and shares them - multiple times, if needed.
 - Draws on their network to point students in the direction of different mentors/support.
 - Shares their experience but doesn’t expect the student to make the same choices.
 - Makes the hidden curricula/invisible pathways visible.
 - LISTENS!

Student's voices: ideal mentors

...for me that the ideal would be someone who sees me as a person, understands where I'm coming from, who can challenge me, not let my excuses get in the way of myself - but they don't feel like it will make or break our mentorship relationship if I don't listen to them. I don't know if that's too much on a person.

Students' voices: Ideal mentoring

I just need to know what is going on in backrooms, what conversations are happening among higher ups that I should be aware of because I think there's a lot of knowledge that if your parents come from academia or they're established in whatever they're doing, there's a lot of knowledge that I just don't have, that I would like to know more about to either become a professor or to work in industry or whatever.

... So, just someone that's very honest about the process, about the system and who tells me what I need to do.

Student Voices: Real mentors

[My faculty mentor] was really nice... And [then] during the presentation, he was like, "Can you talk like you're not a [person with interviewee's cultural identity]?" And I was just like, "What does that even mean? I don't know what that means." ...I think in grad school I'm always kind of, I'm not sure, *careful*.

Student Voices: Real Mentors

So her reaching out on [...] trying to help me navigate that for going there for the first time, I appreciate that because sometimes I don't want to feel a bother to people. So I won't reach out for certain things. So her taking that first step... is always appreciated and stuff like that. ... I feel like I sometimes feel I don't know what is appropriate to ask. ... Like the culture in grad school or the culture in math in general, I feel I'm not familiar with that.

Student Voices: Real Mentors

[One] professor was actually amazing to me. He was actually interesting, amazing, because he was the best kind of... He was even keen to everybody, right? I'm not going to say that he was the warm and fuzzy person that would just come and hang out with you, but if you wanted to talk math and if you wanted an advocate, he was the person, and he was never afraid to fight for [me].

Student Voices: real support

[Professor at graduate school][said], "Come into my office hours regularly. I want to help build your toolbox."

He's so observant. He is always listening and always paying attention, and he noticed that I was very distracted [one] day. And he told me, "You don't have to tell me anything that's going on, but I want you to know that you can. Maybe next week, I'll send you an email, and ask you how you're doing. And if you want, you can respond. And if you want to ignore it, you can do that. But I'll be checking in on you." And I was like, "Okay."

Student Voices: Multiple mentors

...I was able to go to different people for different things. And so whenever I needed a particular thing, it was this Rolodex of people that I could figure out and be like, "Who's the best person to serve [for this]?"

[That] was great because it gave me the different perspectives. It gave me heart and self-love.

Student Voices: the last word

I would want [other students] to know that there is a lot of love and warmth in [this] department, and a lot of room to just be who you are. Being in this department has been very helpful for me in accepting who I am as a person, and who I am as a mathematician. And that I don't need to imagine what a mathematician is, and then try to be that. I just need to imagine who I am, and try to grow in that as a mathematician.

Questions?

Thank you so much for being part of this session today.

Please feel free to reach out!

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