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Navigating the Multiple Roles of Mathematics Graduate Teaching Assistants in Pursuit of Racial Equity, Access, and Justice

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Abstract

- Mathematics Graduate Teaching Assistants (GTAs) play a large role in the socialization of undergraduate students of Color and thus have an impact on their sense of belonging and retention in the STEM fields.
- GTAs occupy a unique role as agents of mathematics socialization, as they are also undergoing their own socialization as doctoral students; in many ways, these roles and this socialization processes constrain GTAs in ways that can be detrimental and marginalizing to students of Color.
- Without being aware of the ways in which systemic racism and white supremacy operate in mathematics spaces, GTAs play a role in upholding racialized hierarchies in STEM by maintaining a culture of exclusivity and elitism in mathematics classrooms.

Keywords

Mathematics, Graduate Teaching Assistants, socialization

CHAPTER 5.

NAVIGATING THE MULTIPLE ROLES OF MATHEMATICS GRADUATE TEACHING ASSISTANTS IN PURSUIT OF RACIAL EQUITY, ACCESS, AND JUSTICE

KRISTYN LUE

KEY TAKEAWAYS

- Mathematics Graduate Teaching Assistants (GTAs) play a large role in the socialization of undergraduate students of Color and thus have an impact on their sense of belonging and retention in the STEM fields.
- GTAs occupy a unique role as agents of mathematics socialization, as they are also undergoing their own socialization as doctoral students; in many ways, these roles and this socialization processes constrain GTAs in ways that can be detrimental and marginalizing to students of Color.
- Without being aware of the ways in which systemic racism and white supremacy operate in mathematics spaces, GTAs play a role in upholding racialized hierarchies in STEM by maintaining a culture of exclusivity and elitism in mathematics classrooms.

I'll never forget the specific blend of excitement and anxiety that came about every semester when the schedule of courses for the following semester was released. UC Berkeley, where I was an undergraduate mathematics major, was a large public research institution that enrolled over 25,000 undergraduates per year. As such, the mathematics department was also quite large—large enough that each required course for my major had at least two sections taught by different faculty members. When the schedule for the semester was released, I would inevitably look up the faculty that were teaching the math courses I wanted to take on ratemyprofessor.com and see what students had to say about

them. Sometimes there was a clear difference between the options, with one professor being rated much higher than the others. Other times, the difference in ratings was barely discernible.

My friends and I would then spend the weeks until our registration appointments discussing which section we should take—was it better to take a class with the more highly rated professor, even if the course was first thing in the morning? We would keep an eye on the number of seats left in our desired sections, lamenting the occasional times when the "good" professor's class filled up. We knew that websites like ratemyprofessor.com weren't the most reliable of websites; there would always be biased reviews and the quantity of reviews also varied amongst faculty. But we had also learned that a "good" math professor and a "bad" math professor made all the difference in our experiences, and trying to figure out who was the best option—and then enroll in their class—was a necessary endeavor.

Defining what made a "good" math professor was complicated, and not just relegated to their teaching styles, though that certainly was a big component. While all of the math faculty were brilliant mathematicians, they varied in their ability to communicate complex mathematical ideas to undergraduate students. I found that the best professors were patient with student questions and were able to explain concepts in multiple ways. They also adjusted exam scores based on how students did; when one of my professors, for example, realized that nearly everyone in our class had failed a specific question on our exam, he told us that he was going to remove the question from the grading of the exam, as that pattern indicated that he hadn't taught that concept well enough. We then spent time reviewing it further in class. This specific professor was also extremely accessible to students and made it a point not only to encourage us to come to office hours, but to set up breakfasts and lunches for students so that we could get to know him and other students in the class on a more personal level.

Of course, not all of my math courses were like that one. There were the faculty who would blame us if we all failed an exam, or indicate that the people who didn't do well on exams should not continue in the math major because we didn't have the intelligence or skill to succeed. Many of my math professors were also unable to communicate concepts in different ways. I remember one professor in particular who, when a student asked a question about something he had drawn on the chalkboard, looked at the student in disbelief, then at the chalkboard, then back at the student.

"Just…. Look at it," he said, pointing at the drawing with his chalk.
"I am looking at it," my classmate replied, "but I don't understand it."
"Well just look at it."

We all sat there in stunned silence as the back-and-forth continued once or twice more, but none of us felt brave enough to try and offer our own explanations for the concept or to tell our professor that perhaps he should try a different way of explaining it. Eventually, the student who had asked the question shook his head in frustration, said "okay," and we moved on with the lecture.

I also had to take courses in the statistics department for my concentration, and some of those courses only had one section being taught. I will never forget going to one of my statistics professor's office hours. He seemed congenial and approachable enough in class, so when I found myself struggling with some of the homework questions, I decided to go to office hours to ask for help. While I can no longer recall the exact exchange between us, I do remember that the conversation was not helpful; as he explained steps of the problem, there was a sense of impatience and occasional frustration that I was not immediately grasping and understanding what he was explaining. Eventually, I became too embarrassed and ashamed to admit that I still didn't understand how to solve the problems we were working on, and I assumed that the problem must be with my own comprehension rather than his explanation (it didn't help that he had written the textbook). I buried my head in the textbook, hoping that some glimmering insight would appear to me.

My concentration was then broken by the sound of shouting. My professor was helping another student—an international student from China who spoke English as a second language.

"WHAT DO YOU NOT UNDERSTAND ABOUT THIS. WHAT IS FUNDAMENTALLY WRONG WITH YOUR BRAIN THAT YOU CAN'T UNDERSTAND WHAT I'M SAYING!"

The pleasant, cheery professor from class had transformed into a terrifying, angry red face who was berating a student for not only not understanding what he was trying to explain, but for not speaking English as fluently as he expected her to. The racialized nature of the incident was also not lost on me, and as an Asian(American) woman who—like the student he was berating—also struggled with understanding both the material and his explanations, I resolved to never go back to his office hours again.

I suspect the other student decided the same.

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The negative experiences I had in the mathematics department during my time as an undergraduate far outnumbered the positive experiences I had. My undergraduate experience was filled with many stressful nights of studying and struggling to complete homework assignments, with the occasional breakdown that ended in tears and questioning if I would be able to successfully complete the major. I was not alone in these feelings; many of my friends also questioned whether we really "belonged" in our major, and whether we would be able to finish and graduate. The math major at UC Berkeley was notoriously regarded as difficult—as were many of the STEM majors. Even the lower-level math courses, which were required for STEM majors outside of the math major, were referred to as "weeder" courses, and those of us who were able to persist seemed to be part of an exclusive "club" that was deemed impressive and intelligent due to the alleged rigor of the courses we took.

In short, it was clear that there were perceptions of who "belonged" in the STEM fields, and who didn't. Students who "belonged" were the ones who could grasp concepts quickly and easily, who didn't struggle as much with exams or homework problems, and who didn't have to go to office
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hours or ask questions in class—in fact, they were the ones who could answer questions posed in class. They were the students who could listen to lectures and read the textbooks and seemed to innately understand exactly what was happening and what we were supposed to be learning. These perceptions were constantly reinforced by our interactions with faculty and in our classroom experiences—especially in, but by no means limited to, the courses taught by the "bad" professors.

As a graduate student who has spent the last several years trying to better understand the phenomenon of "belonging" in the STEM fields, I now understand the roles that student-faculty interaction, race, and racism play in the development of this sense of belonging—or the socialization of undergraduate students in the STEM fields. Over the last few years, I have also come to realize the unique power that graduate teaching assistants (GTAs)—specifically in mathematics—have in facilitating this socialization process; this has become the core inquiry of my dissertation. What follows in the remainder of this chapter is a weaving of my personal experiences and the research on the experiences and socialization of students of Color in the STEM fields to explain how I arrived at this topic, what I have learned thus far, and what mathematics GTAs who are committed to racial justice and equity in the STEM fields and beyond might do to engage in this type of work.

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Research on the retention of students in the STEM fields has highlighted the influences of positive student-faculty interaction and classroom experiences on persistence and achievement in the STEM fields (Cole & Espinoza, 2008; Ellington & Frederick, 2010; Palmer, Maramba, & Dancy, 2011; Seymour, Hunter, & Weston, 2020). Research that focuses specifically on the retention and persistence of underrepresented students of Color in the STEM fields has found that the nature of student-faculty interaction is often contingent on students' race (Cole, 2011; Kim & Sax, 2009; Park, Kim, Salazar, & Hayes, 2019). Underrepresented students of Color are more likely to have negative interactions with faculty, facing discrimination, microaggressions, and racial stereotyping (McGee, 2016; Park, Kim, Salazar, & Eagan, 2020; Park et al., 2020). In other words, STEM faculty both explicitly and implicitly signal to underrepresented students of Color that they do not "belong" in or are "worthy" of being in the STEM fields, which often leads to feelings of marginalization, exclusion, and ultimately, attrition (Carlone & Johnson, 2007; McGee, 2016; Park et al., 2020).

The process through which undergraduate students learn whether or not they "belong" in the field is linked to how students understand themselves as aligning or fitting in with the values, norms, and culture of a field (e.g. Dortch & Patel, 2017; Garibay, 2018; Johnson, 2007). In other words, the development of a sense of belonging happens through a socialization process. While this socialization process happens across the STEM fields and at all levels of students' undergraduate careers, a particular focus on mathematics socialization during the first two years of university is critical for scholars concerned with racial access and equity in the STEM fields, given that mathematics courses are prerequisite (or "gateway") courses into many STEM majors (Adiredja & Andrews-Larson, 2017; Leyva, McNeill, Marshall, & Guzmán, 2021).

It is important to note that the socialization process is supported by actors. In mathematics departments, faculty members are key actors who facilitate the socialization of undergraduate students and, as such, can be thought of as a*gents of mathematics socialization* (Martin, 2000). However, in many mathematics departments, graduate teaching assistants (GTAs) make up a large part of the teaching labor force and have high levels of interaction with undergraduate students. Many either serve as the instructor of record or teach the discussion sections for lower-level undergraduate mathematics courses. Arguably, then, GTAs can have just as large of an—if not a larger—impact on their students' sense of belonging as faculty, as GTAs for lower-level mathematics course are serving as agents of mathematics socialization for undergraduate students of Color during a critical time of their undergraduate academic trajectories (i.e., during these gateway courses).

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During my first semester as a doctoral student, I was teaching several math support classes for students enrolled in a bridge program at the University of Maryland. This bridge program had begun over the summer and was intended to support incoming freshmen students with acclimating both academically and socially to the university environment. Over the summer, students took disciplinary preparation coursework to prepare them for their academic year courses. During the fall and spring semesters, students enrolled in the program took academic support classes and engaged in other forms of individual tutoring, specialized academic advising, and social programming. As a math support instructor, I had taught many of these students over the summer and gotten to know them fairly well. The vast majority of my students were underrepresented students of Color, which was a stark difference from the general student population at the university. While they had taken classes together over the summer with a large cohort of students enrolled in the program, they were now very much a racially demographic minority in their math courses. We spent most of our class time talking about how lectures and discussions had gone, reviewing homework and classwork problems, and preparing for exams.

I'll never forget the day of the first exam for my students who were enrolled in Pre-Calculus. There was a frenzied energy when they burst into the classroom to tell me how—just prior to the exam, when everyone was taking their seats and setting up their pencils and calculators as the GTAs passed out the exam—one of their white GTAs started yelling at them to hurry up and sit down. I was shocked, and clarified a few times whether or not their GTA had actually raised his voice and yelled at them, which they confirmed, adding that not only did they feel frazzled before the exam as a result, but that they were extremely angry and upset that a GTA had yelled at them. Understandably, they found it disrespectful, especially since the exam period hadn't yet started, so yelling at them to hurry up was not only demeaning, but unnecessary. The racialized nature of the incident—where a white GTA was yelling exclusively at students of Color in the class—was also not lost on them.

Later that day, I ended up speaking to my supervisor about this math GTA's behavior. Unfortunately, that wouldn't be the last time I shared frustrations about the math department GTAs with her as it was her role to be a liaison between our department and the mathematics department. I distinctly recall reviewing for an exam with my Algebra and Trigonometry students. Unlike Precalculus, which had a large lecture taught by a faculty member and smaller discussion sections taught by GTAs, Algebra and Trigonometry was taught in small sections, usually with mathematics GTAs as the instructor of record. However, the instructors would all collaborate to create the exams, and students across
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different sections took the same exam—albeit with different numbers in the problems. As we worked together in class on one of the practice exam problems, one of my students raised her hand.

"My TA told us that this kind of problem wouldn't show up on the exam and that it wasn't important for us to learn this concept. Can we skip to the next one?"

Another student turned back to her; eyebrows raised in disbelief. "My TA told us that we had to learn how to do this problem and that it would be important."

The class broke out in frustrated conversation—did they have to learn how to do problems like this one, or not? Some of my students had skipped over this section entirely in preparing for the exam, while others focused heavily on it. And they were all preparing for the same exam.

We ultimately ended up going over the problem, with several of my students now panicking that if a question like this appeared on the exam, they were going to get it wrong because they hadn't studied it enough. I was frustrated at the lack of consensus between my students' mathematics GTAs and felt powerless as a mathematics instructor who was outside of the mathematics department. While it could be argued that my students should be reviewing all of the course content to prepare for their upcoming exam, it was also their first full semester as undergraduate students. Furthermore, many of my students who were enrolled in Algebra and Trigonometry were not entirely confident in their mathematical abilities and wanted to focus on the content that would be important for their exams instead of being overwhelmed by every possible piece of information in their textbooks and lectures. They were acclimating to the pace of their classes, as well as to new living and social environments, trying to navigate transitioning to new communities and new roles as college students. As such, they looked to their GTAs as authority figures that they trusted, who were teaching them the ropes of how to be successful in their course. In providing inconsistent information across sections, I felt that the GTAs were disserving—even harming—my students, and I was frustrated and angry that they couldn't observe the impact that they were having. As graduate students who were also taking courses in the math department, and who had been undergraduate math majors themselves not too long ago, didn't they recognize the importance of being a good instructor, and how much that would influence their students' experiences and academic trajectories?

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At the time of my frustrations with my students' GTAs, I clearly recognized the dual roles that they held as teachers and learners of mathematics. However, while I could also recognize the ways in which holding these multiple roles provided opportunities for GTAs to reflect on and strengthen their roles as teachers, I failed to see the constraints and challenges that navigating these multiple roles presented. Furthermore, I had not yet grasped that GTAs also held a third role in their departments
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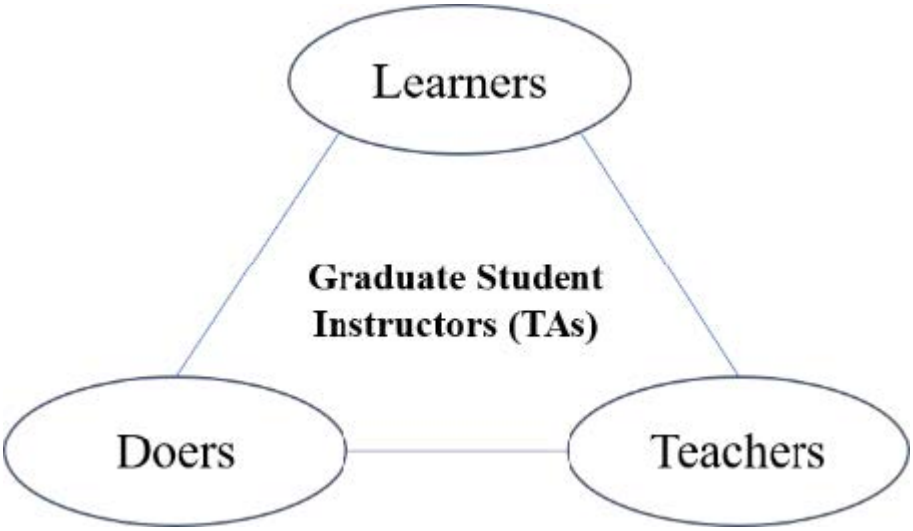
that added an additional layer of tension: doers of mathematics. These roles, which I would not come to fully appreciate until I became a GTA and instructor of record in the mathematics department, as well as a student in a graduate mathematics course, are illustrated below in Figure 1.

Figure 1. *The Multiple Roles of Graduate Student Instructors (TAs) in Mathematics Departments*



The multiple roles that GTAs hold in mathematics departments position them uniquely in the socialization of undergraduate students of Color. As *teachers* of mathematics—whether they teach discussion sections or are the instructor of record for undergraduate courses—they are directly involved in undergraduate student socialization (Harris, Froman, & Surles, 2009). However, many GTAs do not necessarily enroll in doctoral mathematics programs to teach, but to further their careers and research as *doers* of mathematics. Many teach as part of their funding packages in order to finance graduate school (American Mathematical Society, n.d.); as such, they may not primarily consider themselves as teachers of mathematics. A third role that they occupy in mathematics departments are the role of *learners* of mathematics, as they are still students and take coursework from mathematics department faculty.

The unique space that GTAs occupy in mathematics departments—learners, doers, and teachers of mathematics—means that they act as agents of mathematics socialization at a crucial point in their own socialization (Weidman, Twale, & Stein, 2001). Upon entering their doctoral programs, GTAs must learn the normative values, attitudes, and norms of their departments, programs, and institutions (Austin, 2002; Weidman, Twale, & Stein, 2001). These values may differ or conflict with the values that GTAs enter their institution with. However, their success as they progress through their program is contingent on their ability to adapt to their institutional culture and adopt the same norms and values as the full members of that culture (Weidman, Twale, & Stein, 2001). Thus, GTAs must determine whether success in their program will be beneficial to their future career and professional goals, and whether they should adapt to—and uphold—the values of their departmental culture.

At many universities, STEM departmental culture remains traditionally elitist and exclusionary. The

director of the American Association for the Advancement of Sciences' Center for Advancing Science & Engineering Capacity, Daryl Chubin, describes it as "a difficult culture… the culture of science says, 'not everybody is good enough to cut it, and we're going to make it hard for them, and the cream will rise to the top'" (Epstein, 2006; par. 13). Park et al. (2020) refer to this as the "competitive 'sink or swim' climate in STEM" (p. 2), which is reinforced by "the large size of introductory weed-out courses" (p. 2). This culture is also reflected in traditional teaching practices—particularly in mathematics. Such practices often involve imparting mathematical knowledge to students through lectures and gauging students' knowledge through high-stakes assessments (Bergsten, 2007; Hillel, 2001; Leyva et al., 2021). These teaching practices socialize undergraduate students by emphasizing what is expected and normative in mathematics classrooms, and what qualities are necessary to be "good" at math (Adiredja & Andrews-Larson, 2017; Larnell, 2016; Leyva et al., 2021). They also send the message that only a few select people "belong" in mathematics and STEM spaces and that most students are not "smart" or "innately talented" enough to make the cut.

While there are GTAs who do not align with, and thus seek to change, this competitive culture through their teaching practices, they face a multitude of constraints in doing so. One such constraint is time, which was also cited by STEM faculty at Boise State as a large barrier to teaching reform and changing the norms of STEM courses (Shadle, Marker, & Earle, 2017). Time constraints tend to be a large constraint on faculty priorities, especially given the multitude of priorities that are rewarded through processes such as tenure, while others—such as advising, mentorship, and teaching—are not as institutionally valued and prioritized through these processes (Dennin et al., 2017; Fairweather, 2010; O'Meara & Braskamp, 2005). This reward system is mimicked at the GTA level, with coursework, qualifying exams, theses, internships, and research often being key areas of stress and focus for graduate students, as opposed to their teaching. Teaching, then, becomes relegated to a job that pays for tuition and living expenses rather than a formalized part of the doctoral degree and professional development. In other words, mathematics GTAs' roles as *learners* and *doers* of mathematics are often more emphasized, supported, and prioritized by doctoral programs, making them more time intensive roles than that of teaching mathematics to undergraduate students.

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I saw—and felt—these constraints play out during my second year as a doctoral student when I taught as a GTA in the mathematics department. Although I was not taking courses that year in the mathematics department, I was still taking graduate level courses in the College of Education, where my degree program is housed, and working on research projects with faculty. The undergraduate mathematics course I would be teaching was assigned to me at the end of the prior academic year, and I was excited to spend the summer reviewing the course content and preparing materials for the course. I was told that I would be under the supervision of a course coordinator who had been supervising this specific series of courses—which were math content courses for students in the elementary education major—for several years. My peers who had worked with this supervisor had excellent things to say about her, noting in particular how kind and helpful she was, and how much work she put into the course.

As the summer unfolded, I busied myself with other work, and towards the end of July I realized that I hadn't yet heard from my course coordinator and began to stress about learning the material and preparing for the course I would be teaching. Upon reaching out to my coordinator, she told

me where I could check out a textbook and told me that we would be meeting at the start of the semester with the instructor of the other section of this math course, who would be a GTA from the math department. I was confused why we were meeting so close to the start of the semester, and worried that it wouldn't provide enough preparation time. As I soon learned, part of the reason we were meeting so close to the beginning of the semester was because the other GTA had not yet been assigned; in fact, none of the mathematics GTAs had been assigned courses yet. Typically, this was something that didn't happen until the week before the start of the semester because of the number of international doctoral students that were enrolled in and employed by the mathematics department—finalizing visas and ensuring they would be able to attend the university took time, and the mathematics department wanted to be sure that they had a list of all the available instructors before assigning courses.

While I understood the rationale behind the mathematics department's decision not to provide teaching assignments until later in the summer, doing so discourages GTAs to prioritize preparing to teach a course. Understanding the mathematical content, goals, and structure of a course takes time; not providing this time at an institutional level signals to GTAs that these aspects of teaching are not important, valued, or prioritized—and can have detrimental effects on students' classroom experiences. I felt lucky that I had a course coordinator who was incredibly prepared and thoughtful; she provided us with a packet of lesson plans for each of our units, and we met prior to each unit to go through the unit curriculum. These lesson plans could be followed strictly, or we could make our own changes and adapt as was necessary for our sections.

In fact, each course that had multiple sections taught by GTAs as instructors of record had a course coordinator, though I am not sure how much of a standard practice it is for the course coordinators to provide lesson plans for GTAs. Even with the lesson plans provided by my course coordinator—which were thought out and consisted of many small group, active learning activities since my course coordinator had a mathematics education background—I still felt that there was never enough time in the week to adequately prepare for class and be the kind of teacher that I aspired to be, especially given that a single math course was only supposed to take up ten hours a week between teaching, prep, office hours, and grading.

Such time constraints were particularly felt during the weeks surrounding exams. We would meet as a course team to plan the exams and divide up the writing of questions, as well as create a point distribution for the grading rubric. Similar to my students who took Algebra and Trigonometry, all of the students in this course took the same exam, which is standard for courses that have multiple sections taught by GTAs. In theory, this creates a uniform level of "rigor" for a course level by helping to "standardize" the exams and ensure that the "playing field" for grades is even across sections. In practice, however, being graded on the same exam means across sections means that performance is in large part dependent on the quality of GTAs' teaching; since time and opportunities to grow as quality teachers are limited for GTAs, the implicit messaging then becomes that the "good" and "smart" students will pass the exams, regardless of the quality of their teacher, while the rest may feel—as a result of their exam grades—that they are do not "belong" and are not "smart" enough to persist in mathematics and STEM more broadly.

These time constraints that mathematics GTAs face in their teaching roles often mean that the GTAs who seek to change the competitive and exclusive culture of STEM within their classrooms must do

so by taking on extra, uncompensated labor and effort to transform their spaces to best serve their students—in particular, their students of Color. This labor cannot truly be transformative, however, without first reflecting on the ways in which GTAs are positioned and act as both agents and products of mathematics socialization in the unique roles they occupy within mathematics departments. Since socialization happens within the context of cultures, this reflection, in turn, cannot happen without an explicit understanding of the culture of mathematics departments and institutions of higher education in the United States.

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Thus far throughout this chapter, I have referred to the ways in which mathematics spaces are often framed as exclusive and elite spaces, in which people who are "good" at math "belong", while others do not. I have also alluded to the ways in which this hierarchy is racialized, with students of Color often being signaled to—either implicitly or explicitly—that they do not "belong" or "fit" in mathematics and STEM spaces. As Leyva et al. (2021) explain, the exclusive culture of mathematics spaces and the hierarchy positioning people who are "good" at math and STEM as more intelligent and elite is framed by white logics and the ideology of meritocracy. While mathematics is often framed as an objective and neutral subject in which some people have innate ability and talent and others do not, the myth of neutrality serves to uphold and reinforce racialized hierarchies in mathematics, STEM, and beyond (Leyva et al., 2021; Lue & Turner, 2020; Martin, 2009). These hierarchies position Black and Brown students of Color at the bottom of the hierarchy, while positioning white and Asian students at the top, while hiding under the guise of meritocracy—a neoliberal concept through which individual Black and Brown students are pathologized while harmful structures remain in place (Bonilla-Silva, 2018; Lee, 2009).

As Bonilla-Silva (2018) explains, the myth of meritocracy is a form of color-blind racism that has become a dominant narrative to justify and shield white privilege—thus upholding white supremacy and systemic racism. While neoliberal discourses promote the idea that we live in a post-racial society—that is, a society "free" from racism—I contend, as a critical race mathematics education scholar, that racism is endemic and normalized in both our society and in mathematics education (Davis, 2019; Delgado & Stefancic, 2017). This normalization not only renders racism invisible, but also renders our roles in maintaining racism and white supremacy invisible. Mathematics GTAs, for example, play a role in maintaining the dominant racial order in mathematics departments through the maintenance of traditional teaching practices. These roles are normalized through their socialization process and the constraints that they face in their multiple roles within mathematics departments, making it difficult to even begin to identify how to enact truly transformative change in service of Black and Brown students of Color.

How then, can GTAs begin to enact this change? As stated earlier, critical reflection is key. Understanding the ways in which racism and white supremacy operate in society to maintain the dominant racial order and protect whiteness is a necessary first step. Understanding the roles that institutions of higher education and mathematics departments play in these operations is an essential part of this step. From there—or perhaps in parallel—reflecting on the ways in which power and prestige is concentrated within the STEM fields and in mathematics, and how the myth of meritocracy operates to racialize that power concentration is key for GTAs to consider as a foundation for reflecting on their own mathematics and academic journeys. While mathematics GTAs
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face various constraints in their roles at institutions of higher education, there is also privilege and power associated in their roles as agents of mathematics socialization for undergraduate students of Color. True change cannot happen without acknowledgement and acceptance of this power and its benefits.

In providing these steps, I by no means wish to suggest that I have all the answers for how mathematics GTAs ought to navigate their roles as agents of mathematics socialization for undergraduate students of Color, or how they might dismantle broader systems of racism and white supremacy at their institutions. Rather, I invite them to reflect and work alongside me in identifying and naming these structures and systems, as well as our own roles in them. After all, as Delgado and Stefancic (2017) remind us, it is only "once named [that] it can be combated" (p. 51).

REFERENCES

Adiredja, A. P., & Andrews-Larson, C. (2017). Taking the sociopolitical turn in postsecondary mathematics education research. *International Journal of Research in Undergraduate Mathematics Education, 3*(3), 444–465.

American Mathematical Society. (n.d.). *Choosing a Graduate School Path*. http://www.ams.org/education/pre-grad

Austin, A. E. (2002). Preparing the next generation of faculty: Graduate school as socialization to the academic career. *The Journal of Higher Education, 73*(1), 94–122.

Bergsten, C. (2007). Investigating quality of undergraduate mathematics lectures. *Mathematics Education Research Journal, 19*(3), 48–72.

Bonilla-Silva, E. (2018). *Racism without racists: Color-blind racism and the persistence of racial inequality in America* (5th ed.). Rowman & Littlefield.

Carlone, H. B., &Johnson, A. (2007). Understanding the science experiences of successful women of color: Science identity as an analytic lens. *Journal of Research and Science Teaching, 44*(8), 1187-1218.

Cole, D. (2011). Debunking anti-intellectualism: An examination of African American college students' intellectual self-concepts. *The Review of Higher Education, 34*(2), 259-282.

Cole, D., & Espinoza, A. (2008). Examining the academic success of Latino students in science, technology, engineering, and mathematics (STEM) majors. *Journal of College Student Development, 49*(4), 285-300.

Davis, J. (2019). Using critical race theory as a pedagogical, theoretical, methodological, and analytical tool in mathematics education for Black

students in urban areas. In J. Davis & C. C. Jett (Eds.), *Critical Race Theory in Mathematics Education* (pp.183-205). Routledge.

Delgado R., & Stefancic, J. (2017). *Critical Race Theory: An Introduction* (3rd ed.). New York University Press.

Dennin, M., Schultz, Z. D., Feig, A., Finkelstein, N., Greenhoot, A. F., Hildreth, M., Leibovich, A. K., Martin, J. D., Moldwin, M. B., O'Dowd, D. K., Posey, L. A., Smith, T. L., & Miller, E. R. (2017). Aligning Practice to Policies: Changing the Culture to Recognize and Reward Teaching at Research Universities. *CBE Life Sciences Education, 16*(4).

Dortch, D., & Patel, C. (2017). Black Undergraduate Women and Their Sense of Belonging in STEM at Predominantly White Institutions. *NASPA Journal About Women in Higher Education, 10*(2), 202–215.

Ellington, R. M., & Frederick, R. (2010). Black High Achieving Undergraduate Mathematics Majors Discuss Success and Persistence in Mathematics. *Mothers and Fathers, 61*, 61–84.

Epstein, D. (2006, July 26). *So that's why they're leaving*. Inside Higher Ed. https://www.insidehighered.com/news/2006/07/26/so-thats-why-theyre-leaving

Fairweather, James. (2010). *Linking Evidence and Promising Practices in Science, Technology, Engineering, and Mathematics (STEM) Undergraduate Education A Status Report for The National Academies National Research Council Board of Science Education. National Academies.* https://otl.wayne.edu/wider/linking_evidence–fairweather.pdf

Garibay, J. C. (2018). Beyond Traditional Measures of STEM Success: Long-Term Predictors of Social Agency and Conducting Research for Social Change. *Research in Higher Education, 59*(3), 349–381.

Harris, G., Froman, J., & Surles, J. (2009). The professional development of graduate mathematics teaching assistants. *International Journal of Mathematical Education in Science and Technology, 40*(1), 157–172.

Hillel, J. (2001). Trends in curriculum: A working group report. In D. Holton (Ed.), *The Teaching and Learning of Mathematics at University Level: An IMCI Study* (pp. 59-70). Kluwer Academic Publishers.

Johnson, A. C. (2007). Unintended consequences: How science professors discourage women of color. *Science Education, 91*(5), 805–821.

Kim, Y. K., & Sax, L. J. (2009). Student-faculty interaction in research

universities: Differences by student gender, race, social class, and first-generation status. *Research in Higher Education, 50*(5), 437-459.

Larnell G. V. (2016). More than just skill: Examining mathematics identities, racialized narratives, and remediation among Black undergraduates. *Journal for Research in Mathematics Education, 47*(3), 233-269.

Lee, S. J. (2009). *Unraveling the "Model Minority" Stereotype: Listening to Asian American Youth* (2nd ed.). Teachers College Press.

Leyva, L. A., McNeill, R. T., Marshall, B. L., & Guzmán, O. A. (2021). "It Seems like They Purposefully Try to Make as Many Kids Drop": An Analysis of Logics and Mechanisms of Racial-Gendered Inequality in Introductory Mathematics. *The Journal of Higher Education, 92*(5), 784-814.

Lue, K., & Turner, B. O. (2020). The stories we tell: Disrupting the myth of neutrality in math through counternarratives. *Journal of Folklore in Education, 7*, 136-146.

Martin, D. B. (2000). *Mathematics success and failure among African-American youth: The role of sociohistorical context, community forces, school influence, and individual agency*. Lawrence Erlbaum Associates, Inc.

Martin, D. B. (2009). Researching race in mathematics education. *Teachers College Record, 111*(2), 295–338.

McGee, E. O. (2016). Devalued Black and Latino Racial Identities: A By-Product of STEM College Culture? *American Educational Research Journal, 53*(6), 1626–1662.

O'Meara, K., & Braskamp, L. (2005). Aligning Faculty Reward Systems and Development to Promote Faculty and Student Growth. *Journal of Student Affairs Research and Practice, 42*(2), 369-386.

Palmer, R. T., Maramba, D. C., & Dancy, T. E. (2011). A qualitative investigation of factors promoting the retention and persistence of students of color in STEM. *The Journal of Negro Education, 80*(4), 491–504.

Park, J. J., Kim, Y. K., Salazar, C., & Hayes, S. (2019). Student–faculty interaction and discrimination from faculty in STEM: The link with retention. *Research in Higher Education, 61*(3), 330–356.

Park, J. J., Kim, Y. K., Salazar, C., & Eagan, M. K. (2020). Racial discrimination and student–faculty interaction in STEM: Probing the mechanisms influencing inequality. *Journal of Diversity in Higher Education, 15*(2), 218-229.

Seymour, E., Hunter, A. B., & Weston, T. J. (2019). Why We Are Still Talking About Leaving. In E. Seymour & A. B. Hunter (Eds.), *Talking about Leaving Revisited: Persistence, Relocation, and Loss in Undergraduate STEM Education* (pp. 1–53). Springer International Publishing.

Shadle, S. E., Marker, A., & Earl, B. (2017). Faculty drivers and barriers: Laying the groundwork for undergraduate STEM education reform in academic departments. *International Journal of STEM Education, 4*(1), 8.

Weidman, J. C., Twale, D. J., & Stein, E. L. (2001). Socialization of graduate and professional students in higher education: A perilous passage? *ASHE-ERIC Higher Education Report, 28*(3), 1–112.