Mentoring Approaches that Support Minoritized STEM Undergraduates: A Pilot Study (EBR)

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Abstract
This work presents the research methods and preliminary results from a pilot study that assesses mentoring approaches used to support racially minoritized students in science, technology, engineering, and mathematics (STEM) fields. There is a national imperative to broaden participation of racially minoritized undergraduates in STEM fields as evidenced by reports and the recent calls for social justice and equity in these fields. In STEM, mentoring has been recognized as a mechanism that can help to support racially minoritized student populations (e.g., persons who identify as Black, Hispanic/Latinx, and American Indian/Alaskan Native). Yet for mentors in higher education, minimal examples exist that detail effective mentoring approaches, strategies, and competencies that support the persistence and success of minoritized mentees in STEM. In better understanding mentoring approaches, we can make visible how to better mentor these populations and help to employ more equitable mentoring participation. The research question guiding this study is: *What approaches are used by mentors who help racially minoritized undergraduate mentees persist in STEM fields?* Mentoring literature and two theoretical frameworks were leveraged to situate these mentoring experiences. Intersectionality theory is used to explore the role of compounding minoritized identities within the power contexts (i.e., structural, hegemonic, disciplinary, and interpersonal) of higher education. Community cultural wealth is also used as a lens to examine six forms of capital (i.e., family, social, navigational, aspirational, resistant, and linguistic) that may be used in mentoring practices with minoritized students. This paper will present the methods and findings from the pilot study, centering on the development of the team's interview protocol. This work will provide insights about the piloting process of a larger study as well as initial emergent themes about the approaches and experiences of mentors who mentor minoritized undergraduate students in STEM.

Introduction
Research has shown that mentoring can improve the participation and persistence of historically marginalized students in STEM particularly students who identify as Black, Hispanic/Latinx, and Indigenous [1]–[3]. Mentors have been tasked with the role of supporting mentees in career development as well as psychosocial support [3], [4]. Mentors have varying approaches to support their minoritized mentees. For example, mentors can use a guidance and resource directed approach, or an empathetic approach [5]. The context in which mentoring occurs (e.g., in a research group or informal) can also influence the outcome [6]. There have been several studies on mentoring of students. However, there is a paucity of literature that examines effective mentoring approaches for minoritized individuals in higher education [7], [8]. In making visible effective mentoring approaches, we can better understand ways to use these approaches to support the development and persistence of students in STEM higher education. As a result, we can help to increase the numbers of STEM professionals entering the workforce and minoritized faculty and mentors in STEM higher education.

The purpose of this paper is to present preliminary findings about mentoring approaches used by effective mentors. The research question guiding this study is: *What approaches are used by*

mentors who help racially minoritized undergraduate mentees persist in STEM fields? This work will provide insights about the piloting process of a larger study as well as initial emergent themes about the approaches and experiences of mentors who mentor minoritized undergraduate students in STEM. In the following sections, we first present an overview of mentoring and the theoretical framing used in this study. Next, we detail interview protocol development, and recruitment of participants. Finally, we discuss the data collection, data analysis, findings, and conclusions.

Mentoring
The concept of mentoring has existed since classic times. In Homer's Odyssey, Mentor was charged with guiding, educating, and protecting Odysseus's son, Telemachus, while Odysseus went to battle at Troy [4]. In more contemporary times, mentoring has been defined as a relationship in which a more experienced person helps to guide and counsel a lesser experienced person with an emphasis on personal and/or career development. Mentoring is also seen as a way for the mentor to redirect and reassess their energy in creative and productive action. [4], [9]. The mentoring relationship has also been likened to a role-model/observer relationship. Mentoring is traditionally seen as facilitating young people's transition to adulthood, and a career development tool [10], [11]. Mentoring serves several purposes such as providing career guidance, psychosocial support and development, and role modeling [4]. Career guidance can help mentees develop knowledge of the organization or the specific position, skill development and navigation up the ranks of an organization into more senior leadership positions. Psychosocial support involves intimacy, trust, self-efficacy, counseling, and friendship [4], [12]. Through their achievements, mentors may also serve as role models for their mentees. In sum, mentoring is a process that engages mentors in supporting mentees' development. Subsequently, mentors' experiences and perceptions may impact their approaches to mentoring.

Theoretical Framing
Two theoretical lenses were used to frame the study: intersectionality and community cultural wealth. Specifically, we were interested in examining the intersectional experiences of mentors and how that may have impacted their mentoring relationships and perceptions. Mentoring can be effective in positively influencing the academic outcomes of minoritized individuals [8], [13], [14]. When mentoring minoritized individuals, one might leverage their intersectional lived experiences (intersectionality) and the various forms of capital they may use to navigate personal and professional communities (community cultural wealth). In this work, intersectionality theory is used as a lens to understand the role of people's identities in certain power contexts. Community cultural wealth is also used as a lens to examine six forms of capital (i.e., family, social, navigational, aspirational, resistant, and linguistic) and how they may be used in mentoring practices with minoritized students. In the following paragraphs, we provide a brief overview of these frameworks and their relationship to the study.

Intersectionality
Intersectionality theory involves how interlocking structures of oppression (e.g., racism) and social identity constructs (e.g., gender) work together to affect the lived experiences of individuals [15], [16]. Scholars like Anna Julia Cooper explained the concept of intersectionality when referring to women of color as: "she is confronted by both a woman question and a race problem, and is as yet an unknown, or unacknowledged factor in both" [17 p.77]. Approximately

one century later, the term *"intersectionality"* was coined by critical legal scholar, Kimberlé Crenshaw in 1989 and centered in black women's experiences relative to both race and gender. Crenshaw stated, "...the intersectionality experience is greater than the sum of racism and sexism…" [16]. Though grounded in black women's experiences, the concept can be applied to other identity intersections (e.g., race and sexuality). Therefore, our lived experience can be viewed as a combination of our intersecting social identities, and their combination is not linear, but complex in nature.

Power can be thought of as the ability to perpetuate a matrix of domination, and lies at the intersections of race, gender, class, ableness, etc. [18]–[20]. In intersectionality theory, power domains (i.e., structural, hegemonic, disciplinary, and interpersonal) are the mechanisms through which oppression is transmitted to marginalized populations. Structural power can be thought of as the systems that perpetuate oppression and marginalization in society such as prison or education systems. Hegemonic power results from cultural beliefs that reinforce prejudice towards certain groups. An example might be thinking that all Latinx individuals are undocumented immigrants. Disciplinary power is the unfair punishment or denial of resources to individuals or groups. This might be evidenced by poorly funded minoritized school districts that deny students resources to be competitive in college admissions. Interpersonal power can be the daily microaggressions faced by minoritized individuals. An example is not being acknowledged by a store clerk while waiting to be served at the counter. Mentors of minoritized individuals may thus be tasked with cultivating awareness that barriers faced by the mentee are often correlated with the interplay of their different social identities. In this study, we leverage the overarching concept of intersectionality as well as the four components of power to better understand mentors' approaches with their mentees.

Community Cultural Wealth
The community cultural wealth model states that there are forms of capital that have been used by marginalized communities to thrive, adapt, and resist within the framework of the dominant culture [21]. This model contains six forms of capital: familial, social, navigational, aspirational, resistant, and linguistic. Family capital consists of the values, norms, and cultural knowledge people learn from kinship that forms who they are. For example, some families might have a morning phone or video call involving all family members to check in with one another and share important news that builds capital between members. Social capital is thought of as the community resources and networks that individuals access from their communities or networks. An example of this might be the professional networks that people engage in and may leverage to identify career opportunities or other supportive resources. Navigational capital may manifest as someone having the proficiency and resources to maneuver effectively through society. For example, graduate students may receive advice or assistance from postdoctoral fellows about navigating the job market. Aspirational capital encapsulates the dreams, goals, and vision of the people to whom you belong. An example of this could be parents' desire for their children to achieve more than they did (e.g., socially, academically, professionally, financially, etc.). Resistant capital is defined as the "push-back" response when opposed, whether overtly or through implication. This may present as people expressing their opposition through their involvement in protests. Linguistic capital is the language that is known only by your community. This could be an actual non-English language, a dialect, a certain vocabulary, or the art forms of the community (music, poetry, etc.). Whether mentors belong to the dominant

culture or not, they should conduct research and invest the necessary time to learn about mentees' cultures. This may also help the mentee feel valued and validated as a whole individual, and not viewed with a deficit lens. In this study, we leveraged the overarching model and its six forms of capital to better understand mentors' approaches with their minoritized mentees.

Methods
There were two main sources of data collected for this pilot study: individual contextual backdrop summaries and individual interviews. The following sections detail the recruitment of participants before discussing the methods for collecting and analyzing these sources of data.

Recruitment of Participants
After receiving Exempt approval from the Institutional Review Board, the research team identified 5 individuals to pilot the interview protocol. These mentors needed to: (1) be a STEM professional practicing for five years or more and (2) have effectively mentored racially minoritized undergraduate students in STEM as evidenced by their experiences. For the post study, mentors are identified through a crowdsourcing process of the broader STEM community. For pilot study purposes, the team reached out to potential participants who they recognized as being highly effective mentors of minoritized STEM mentees based on their public mentoring record. The mentors were emailed to recruit them for participation..

Contextual Backdrop Summaries
After recruitment, the research team generated individual contextual backdrop summaries for each participant. Table 1 provides information on each of the participants included in this pilot study, including their pseudonym, race, gender, mentoring role, and type of institution they work for. As discussed below, these contextual backdrops were used in the interview coding process to provide familiarity with the participants before coding the individual interview transcripts.

Table 1
Overview of Pilot Study Participants

Pseudonym	Race	Gender	Mentoring Role	Institution Type
Eric Lantz	African American	Man	DEI Manager	HWI, 4-year
Hannah Green	White	Woman	Faculty/Coordinator	MSI, 2-year
Sean Bailey	White	Man	Faculty	HWI, 4-year
John Cross	African American	Man	Faculty	HWI, 4-year
Sarah Holmes	African American	Woman	Program Coordinator	HWI, 4-year

*Note: HWI = historically White institution, MSI = minority serving institution

Interview Protocol Development
The interview protocol was developed by the research team. The protocol was grounded in the previously mentioned theoretical frameworks of intersectionality and community cultural wealth and guided by mentoring literature. Interviews were conducted via an encrypted institutional Zoom software for 60-75 minutes using a semi-structured interview protocol. The interviews were then transcribed via a third-party transcription service.

Interview Analysis

Several steps were taken by the research team to create a collective codebook to analyze the data. After cleaning the transcripts, we first worked independently to generate their own codebooks for each interview. Interview transcripts were coded in two rounds, completing both rounds before moving on to the next interviewee's transcript. This process began with reading the contextual backdrop summary for the interviewee followed by a full read of the transcript to focus only on familiarizing ourselves with the content. The first round of coding was an inductive open-coding process, in which the team identified emergent themes. The second round of coding was an inductive process, in which we restricted coding to the guiding theoretical frameworks (i.e., intersectionality and community cultural wealth) as they related to mentoring. This resulted in a completed codebook for each interviewee's transcript. The researchers repeated this process until all five interviews were coded to generate five separate codebooks. After coding the five transcripts, the researchers independently consolidated these codebooks so that each had one codebook for the five interviews. The two researchers then came together to merge their separate codebooks into a final consolidated codebook.

This merging process took place over several meetings. Where applicable, codes that were overlapping were merged. Once completed, the researchers went through this consolidated codebook code-by-code to co-define its meaning, discuss the quotes pulled out from the transcripts, and co-generate the themes that existed under each quote. After this was completed, the researchers consolidated the codebook, working to finalize and clearly distinguish between the codes. From this process, a total of 115 quotes were pulled out from the five interviewee transcripts that were sorted by 37 codes. These codes covered four categories, two were the guiding theoretical frameworks and two emerged from the open coding and codebook consolidation process: Intersectionality, Community Cultural Wealth, Mentoring, and Coping. The category Mentoring had 20 codes across four sub-themes: Perceptions, Competencies, Experiences, and Approaches. Mentoring Approaches was broken up into 16 separate codes.

To determine the themes from Mentoring Approaches to be included in the paper, we sorted the mentoring approach quotes based on "richness." Here, richness was determined using the number of unique codes attributed to a unique quote. For instance, two of the 115 quotes in this pilot study had four codes attributed to them, whereas 88 quotes had only one code. "Richness" was used as quotes with more unique codes attributed to them were then considered to contain more information on topics of interest for this study. As the focus of this paper is on mentoring approaches, the analysis began by focusing only on quotes that had at least one mentoring approach code. From the 45 unique quotes under mentoring approaches, 15 were found to have at least one other code attributed to them. Specifically, one quote had 4 codes attributed to it, two quotes had three codes attributed to them, and 12 quotes had two codes attributed to them, for a total of 34 codes across 15 unique quotes. The breakdown of these 34 codes across the 15 quotes is detailed in Table 2. Each of the four main categories of codes were included (i.e., Intersectionality, Community Cultural Wealth, Mentoring, and Coping) as rich quotes for Mentoring Approaches. As expected, there are more codes under the Mentoring Approaches

Table 2

Distribution of Codes for "rich" Quotes under Mentoring Approaches

Category	Code	Frequency
Mentoring		**20**
	Approaches	17
	Enacting Advocacy	*4*
	Providing Honest Feedback	*4*
	Engaging in Active Listening	*2*
	Facilitating Goal Setting	*2*
	Aligning Expectations	*1*
	Direct Communication	*1*
	Identity Affirmation	*1*
	Resource Direction	*1*
	Role Model	*1*
	Perceptions	2
	Experiences	1
Intersectionality		**9**
Community Cultural Wealth		**4**
Coping		**1**

category. However, four sub-themes under Mentoring Approaches stood out: *Enacting Advocacy, Providing Honest Feedback, Engaging in Active Listening,* and *Facilitating Goal Setting*. The rich quotes found under these four-subcategories and resulting themes were used as the starting point for organizing and synthesizing the findings.

Positionalities of the Research Team
The research team consisted of three members from various backgrounds and experiences which contributed to the interpretation and triangulation of the data. The first author experienced all of her higher educational training at historically White institutions (HWIs). Currently, her research focuses on the mental health experiences of engineering graduate students. She is aware that some of her experiences as a first-generation, White cis gender woman in engineering as well as her research as it relates to minoritized students may cause her to seek to validate her experiences and findings. The second author is a Black cis gender male, who is a native of Jamaica, but has resided in the United States for 30 years. He has been educated in the STEM area at HWI institutions, has taught at HWIs, and currently teaches at a community college. He has experienced mentoring through enrichment programs, informally and formally, throughout his career, and been a mentor to STEM undergraduates. His doctoral research centers on cross-cultural mentoring in STEM higher education. These perspectives may contribute to how he analyzes and interprets the data. In addition to this, sharing similar identities and experiences with participants allowed a certain level of comfortability during the interviews. This may have facilitated more openness and transparency on the part of the participants. The third author is an African American cis gender woman whose research scholarship focuses on investigating

mentoring approaches, relationships, and programs. She has extensive experience interviewing mentors who work with minoritized populations. In this work, her ability to build rapport with the participants may have provided the participants with an environment to feel comfortable with sharing their experiences. Overall, the research team's various positionalities were leveraged to contribute to the rigorous assessment of the data, codebook, and emergent themes.

Results and Discussion: Mentoring Approaches
The following sections discuss the preliminary results about mentoring approaches that emerged from the interview data. The quotes and themes from these four main codes are discussed, in the following order: *Engaging in Active Listening and Adapting to Mentees' Needs, Providing Honest Feedback, Facilitating Goal Setting*, and *Enacting Advocacy*. Given that the interviews were guided by intersectionality and community cultural wealth frameworks, these themes will also be discussed throughout the sections.

Mentoring Approach #1: Engaging in Active Listening and Adapting to Mentees' Needs
Two mentors discussed *engaging in active listening* with their mentees. Active listening is defined here as how the mentor takes in the information provided by their mentee and the responses they provide to the mentee. Eric describes what this process is like for him when listening to a mentee:

> Listening to what they're saying. I found that sometimes students present one thing, and they're really trying to tell me something else. I'm trying to hear what's happening. I'm also trying to hear, is [it] intrinsic motivation or extrinsic motivation? Is it Mom and them? Is it that everybody back home is proud of them, and they want to come to (school) and that's why they want to be an engineer?

Eric described that when listening to his mentees, his goal is more than to just hear what they are sharing, but to understand the motivation behind what is being shared. By using *active listening*, Eric can keep his focus on the student to understand what their true motivations may be. Mentors engage in active listening to better understand the needs and goals of mentees [22]. Active listening, although found to be a primary tool, is not the only one Hannah uses in her conversations with mentees. She said:

> It's important to … [be] both guiding and active listening, guiding to prompt conversation when there isn't conversation, but active listening most of the time, because it's their time to, to talk and it's their time to explore. And you as a mentor [are] someone, you're in a professional situation, and you're someone who is there, is a resource to share your experiences and your knowledge and so on. But, they're there to talk through things, to explore their goals.

For Hannah, although the goal is to listen to what the mentee is sharing and to provide a space for them to explore their goals, as a mentor you are there as a resource and a guide to help facilitate the conversation. Mentors may provide familial support, guidance and resource acquisition, and empathy in their mentoring approaches to help mentees [8].

The code *adaptable* also emerged as a salient mentoring approach. This code demonstrates the motivation behind *engaging in active listening* with mentees. In all the interviews, being *adaptable* was described as how a mentor considers the needs of their students. This theme complements *engaging in active listening* as it demonstrates how these mentors were intentional in considering their students' varying needs on a situational basis. For example, Eric shared *"The more I know about them, the better I feel like I can help. I feel like it's got to be tailored and customized to who they are."* This demonstrates how Eric tries to adapt his mentoring approach with everyone he is mentoring. To do so, he tries to learn about them and then tailor his approach accordingly. He expands on this:

> [I'm] trying to figure out what their goals are. Then trying to tailor my advice. Not just be like, "Here's the formula." If I do know there's a formula, I know that everybody might hear it differently. That's what I try to do. I try not to make any generalizations. I try not to say, "This worked with three other students, so it's going to work with this one." Then you lose sight of the person in front of you. You're just thinking about, "There's something wrong with them, because it worked for the other three people." Another thing I try to do is shut off my mind, and just focus on them. I push away from my computer, and I turn to them and try to focus. Sometimes I could get a little distracted, and not be giving you my full attention. I can improve on that. There are times where I am mentally focused on focusing.

Eric expands on the idea that there is no formula or generalization he can follow in mentoring. Instead, the approach he takes is to intentionally focus on the individual and what they need. Tailored mentoring approaches are important to help meet the individual needs of mentees and support their professional identity development [23]. Although this may go unnoticed by the mentees, there may be instances in which this approach can be observed directly in the interactions. Sean shared how this comes up when talking to undergraduate students about applying to graduate school:

> When an undergraduate applies at grad school, the first thing they'll do is they'll say to me, "So where should I apply?" That's a very reasonable question. But I can't really answer it until I know more about what they're trying to accomplish and also in the context of what their record is, so what is attainable. We can have that conversation. We can talk through all the dimensions of it.

Sean exhibited a desire to tailor and provide advice to mentees on an individual basis. However, to do so he needs to actively redirect the conversation to first get an understanding of who they are, what their goals are, and what he feels is appropriate advice before providing it. Collectively, these mentors demonstrate how they used active listening and adaptability to personalize their mentoring approaches.

Mentoring Approach #2: Providing Honest Feedback to Support Mentees
Providing honest feedback to mentees was a theme seen across all 5 interviews. This code was described as a mentor providing direct and honest feedback to a mentee with the intent to help them succeed. Sarah shared an instance of needing to give direct and honest feedback to a mentee regarding how they dressed on campus. She said:

One example is a student that, he was just on top of everything, a go-getter, doing well in his classes. He came into the office one day with a do-rag on. And, I checked him, "What are you doing?"[...] I said, "When you go home ..." No, I really told him, "Look, you're at a different place in your life." I said, "If you went home," he was from [east coast city], "and you walked to the corner store with that do-rag on, you would look like anybody else that could be out on the street, selling drugs, doing something that could get them arrested, or something even worse." I said, "You need to elevate yourself. You need to dress in the way that's reflective of what you're pursuing right now." ... I think that's one example of my being intrusive, where I felt like his habits could interfere with his progress as a Black man. No one is going to ask. No one is going to give you the benefit of the doubt.

Sarah's interaction with a male student showcases how core principles of intersectionality may influence her mentoring approaches. The students' choice to wear a do-rag, regardless of intent, was something that Sarah felt the need to address given the potential implications and consequences both personally and professionally at a historically White institution. Sarah's experience demonstrates how the mentoring of minoritized students may be influenced by key elements of intersectionality and power domains (i.e., disciplinary and hegemonic power). That is, through hegemonic and disciplinary power, wearing a do-rag on an academic campus is something that could result in the student being perceived in a negative light. The mentor provides honest advice in an effort to protect and support the mentee's personal wellbeing and professional reputation.

Providing honest feedback also occurred for Sarah in situations where she addressed a mentee's struggle with focusing on coursework given a desire to become involved with the Black Lives Matter movement and protests, she said:

You go and protest … instead of writing your paper, guess where you're going to be at the end of the term? [...] back in your native city, your hometown, being the [...activist], working in McDonald's, who knows what? You have an opportunity to make a change on a different level. Don't let your protesting, don't let your activism interfere with that. With your degree, you can do so much more. You can enter the circles. You can sit at the tables, where those changes can be made, where those changes need to be made.

Although Sarah can relate to and understand her mentee's desire for activism, here Sarah demonstrates how *providing honest feedback* can help her mentee critically consider and weigh how to make choices that support their progress and beliefs. However strenuous it may be to provide advice in these difficult situations, the intention is to support mentees and help mentees navigate their academic careers. Providing difficult honest feedback is a role often assumed by mentors and involves mentees having to negotiate their options and make their own decisions [24]. Hannah shares a similar experience providing honest advice to a student navigating the transfer process, she said:

We were ready for them to transfer and they totally did not finish any of their classes in the summer and I couldn't get a hold of them. ... I was trying to contact them and bugging them ... they finally got a hold of me and (their advisor) that fall.... And they both showed

up at my office and they were like, Hannah, so we're sorry. And they were like, well, what can we do now? And I was like, all right, all right, OK, let's just go from here. And I was like, OK, make an appointment with the (advisor) like A.S.A.P. now and figure out what you [have] got to do to finish your classes ... they were like, you know, are we, are we still going to be able to transfer? And I was like, yes, we're going to make it work. You're going to make it work, but you [have] got to do this. And they were like, OK, OK.

As with Sarah, Hannah also found herself needing to provide honest advice to a student who had previously lost contact during a transfer process. When the student re-initiated contact, rather than choosing to say it was too late, Hannah was honest with them that to make this still work they needed to take action immediately, allowing the student to assess whether or not this was something they still wanted to do. In situations where mentees' make mistakes, rather than highlight or add to this stress, Hannah demonstrated the need to provide her mentees with honest, direct, and non-judgmental feedback before putting the decision back in their mentees' hands. Feedback from mentors can help guide mentees in making academic or research decisions [25].

Mentoring Approach #3: Facilitating Goal Setting to Support Agency
Facilitating goal setting was an emergent theme in two interviews. This theme was defined as mentors providing help to their students in setting milestones. Eric discussed his technique for goal setting and how he centers navigational capital in his approach. He said:

> I'm usually going to have a bigger picture or a better idea of what their resources are. You may not see the connection. The reason I do that is so that they never feel like I'm pushing my own agenda, or I'm trying to live vicariously through them, or I'm trying to make up for something that I didn't get to do when I was their age. Whenever I feel like they aren't listening, or it's not getting through, or they're not making positive steps toward what they want to do, the first thing I would try to do is get them to see it first. What I try to do is say, "This is what you said you wanted to do. How do you think you are progressing toward that? What have you done in the last week, or three weeks or something, toward that goal?"

As described above, Eric uses reflective listening practices to help mentees see the alignment in what his mentees are saying and doing with the pathways and goals they have communicated to him. In doing so, he intentionally helps the students see the connection, or misconnection, between the goals they have set and how they are thinking of reaching them. It is important here, as seen in other themes, that Eric supports students in maintaining their agency to make their own choices. When he pauses and has the mentee see the path for themselves, he may be helping to teach them critical thinking skills to navigate decision making and apply what is learned to different situations. Supporting the development of agency are key aspects in helping mentees learn how to think critically, make their own decisions, and self-advocate for themselves [26]. *Agency* (defined as how the mentor helps their mentee take ownership of their life), where Eric expands on this. *Sometimes, your best advice is no advice. Let it play out, and just remind them that you'll be there. I feel like I got the most when my mentors gave me some direction and let me figure it out.* As he puts it, the goal is not to decide their paths for them, but to instead provide the tools and support they need in those moments to make those choices themselves.

There are also other ways mentors help students progress toward their goals outside of providing advice in difficult situations. Sarah discusses a visioning exercise she uses with her mentees: *I always tell students, "Write down your future title. You are Dr. Jones. You are Dr. Holmes. You are Dr. Smith. And you will walk into that. You see it every day. Put it on your mirror, and you'll become that."* In this context of mentoring graduate students, Sarah helps her mentees' vision the end goal of earning the title "Dr." at the end of their degree program to cope with stressors in graduate school and motivate themselves throughout their academic journey. Similarly, mentoring has been shown to assist in helping students achieve their academic and career goals [27].

Mentoring Approach #4: Enacting Advocacy to Protecting Mentees
Enacting advocacy, defined as the mentors' willingness to use their influence to assist and protect their mentees, was a theme found in all five interviews. John discusses an experience as a faculty member where he had to advocate for a student to not be removed from a program when others were intentionally not sharing this information with her. He said:

> We made a commitment in that proposal to recruit minority students. There was a minority woman, graduate student, who was supported by the fellowship provided. I went to talk to the department administrator, the one who had asked me to write it initially. I said, "Well, we got to make a report, but we're okay on our minority participation, right?" She said, "No, this student, they're going to remove her from the program." I said, "What are you talking about?" She says, "Well, she didn't pass one of the qualifiers." I said, "If she doesn't pass the qualifier, all she has to do is take the corresponding course and if she gets a grade of B or above, she's satisfied that requirement." I went to the Chairman and said, "That's what has to be done." Sure enough, she took the course and made an A. She got her PhD in four years. If I had not been in the department they would have washed her out. … When we knew we had other mechanisms for keeping her in the program, nobody else was saying anything. Of course, I was the only Black faculty person at that time. Even the person with whom she was working [with] did not speak up for her.

As described above, despite their being pre-established policies for graduate students to remain in their programs, John experiences instances where he needed to advocate for the student to complete their degree. The mentee had intersecting minoritized identities of being both a woman and Black student in the program. John being the only person advocating for her (being a fellow minoritized faculty) highlights the structural power at play to perpetuate inequity for minoritized students. That is, despite their being an established policy, members of the faculty and even chair of the program had decided to withhold information. If not for John's actions, she would have been forced out of the program. This demonstrates how mentors can be instrumental in protecting mentees [28].

The need to advocate for minoritized students, however, does not start only when a student is in the program. Sean shared his experiences in admissions advocating for students. He said:

> I've run graduate admissions too. You have to advocate there because, often, the record doesn't look the same, or some of the schools don't look like what people are familiar with. So that is something you need to spend more time on to convince colleagues.

Colleges' hesitations and uncertainty with schools they are less familiar with may have an inequitable impact on minoritized students, both at the undergraduate and graduate level. Mentoring of minoritized individuals can be effective when mentors recognize the necessity for diversity and strive for minoritized mentee inclusivity [29]. For example, students coming from minority serving institutions may be less likely to be considered by faculty at HWIs given ongoing disparities in the student and faculty population alike [30].

Sean's experience with needing to advocate for minoritized students in administrative roles was also reciprocated in Eric's interview. Eric said:

> One of the things you can do in an administrative role is you can advocate for students because you have some information. You can go to work and try to make that better because you have a seat at the leadership table. You can say, "I've been having conversations with students." What I like about my current leader[ship position]... I don't like to be called on, but there are so many parts of my job that I like that I can't trade the stuff that I don't like.

This quote highlights how vital having a seat at the table can be in creating a voice for these students. Although mentors may not enjoy being in these positions, the importance of these roles to advocate for and support these students makes the tradeoff worthwhile for Eric. Moreover, research shows that minoritized students can benefit from mentoring received through campus programs (like the one Eric leads) designed to advocate and facilitate their participation [31].

Conclusion
In this pilot study, we examine qualitative interview data to identify emergent themes about the mentoring approaches used to support racially minoritized students in science, technology, engineering, and mathematics (STEM) fields. We do so by answering the research question, *What approaches are used by mentors who help racially minoritized undergraduate mentees persist in STEM fields?* Using established best practices for qualitative research, the study team coded the interview transcripts, resulting in 115 quotes and 37 codes across four major themes: Intersectionality, Community Cultural Wealth, Mentoring, and Coping. The analysis found four rich codes related to the theme of Mentoring Approaches, which translated to the subthemes of *Engaging in Active Listening*, *Providing Honest Feedback*, *Facilitating Goal Setting*, and *Enacting Advocacy*.

Mentors' of minoritized students found themselves needing to *engage in active listening* to adapt to their mentee's needs. This was seen by the mentors adapting and tailoring their advice to customizing their approaches to best serve their mentees' needs. However, thes were not always straightforward approaches. Mentors also realized the need to *provide honest feedback* to best support their mentees. This looked like sometimes telling students "hard truths" about how the mentors themselves viewed the situation or problem the mentees were facing. Although this could cause tension or be difficult to manage, an important aspect of this mentoring approach was that the decision was ultimately left up to the mentee. The role of the mentor was to provide advice to support their mentees; however, what the mentee chose to do with the advice was left to them. This does not mean, however, that mentors did not support their mentee's decision making. In these interviews, mentors discussed the role of using conversation to *facilitate goal*

setting to support their mentee's agency. Mentors used goal setting as a scaffolding technique to help their mentee's decision-making process. Whether that be by directly prompting them to consider how their choices aligned (or misaligned) with previously shared goals, or by asking them to reflect on their progress towards their goals, the mentors' approach to *facilitating goal setting* was teaching their mentees to apply critical thinking to structure their decision-making process. Finally, mentors' support for their mentees did not exist in a vacuum of interactions with their mentees. Mentors in this study shared how they *enacted advocacy* to protect their mentees. Given their minoritized status, these students would often be subject to explicit and implicit racialized and/or gendered biases and/or discrimination. In these situations, mentors would find themselves being one of the few, if not only, voices in spaces of power and decision making to advocate for these students. Although students may not have always been aware of every instance that this happened, this mentoring approach helped build rapport, trust, and a social support system for individuals.

Collectively, these four mentoring approaches provided an initial look into the relevant themes for mentoring approaches leveraged by those mentoring minoritized undergraduate students in STEM. Furthermore, although this paper focuses on results as they pertain to Mentoring Approaches, this pilot study provided insight into what themes and approaches we might expect to find in the larger study as it pertains to the four categories of Intersectionality, Community Cultural Wealth, Mentoring, and Coping. These preliminary findings will also be used to help create a repository of mentoring approaches and practices that can assist in educating and broadening the pool of effective mentors that support student persistence.

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