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# Mentorship for Transfer Student Success in STEM Research: Mentor Approaches and Reflections

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## ABSTRACT

Mentorship has been widely recognized as an effective means to promote student learning and engagement in undergraduate research experiences. However, little work exists for understanding different mentors' perceived approaches to mentorship, including mentorship of students from backgrounds and educational trajectories not well represented in science, technology, engineering, and mathematics (STEM). Transfer students, in particular, face unique trajectories in their pursuit of research opportunities, yet few studies investigate how mentors describe their approaches to supporting these students. Using semistructured interviews, this study examines how mentors approach mentoring students from diverse backgrounds as research trainees, with an emphasis on transfer students. First, using phenomenography as an analytical approach, we identified four categories describing variations in how mentors reflected upon or accounted for the transfer student identity in their approaches. We find that research mentors vary in their understanding and exposure to the transfer student identity and may have preconceived notions of the transfer student experience. Second, we present vignettes to illustrate how mentors' approaches to the transfer student identity may relate or diverge from their general approaches to mentoring students from different backgrounds and identities. The emerging findings have implications for developing effective mentorship strategies and training mentors to support transfer students.

## INTRODUCTION

In the United States, efforts toward increasing participation in undergraduate research experiences and graduate programs have been a proposed avenue for increasing the number of professionals in science, technology, engineering, and mathematics (STEM) fields (Russell *et al.*, 2007; Carter *et al.*, 2009; Adedokun *et al.*, 2012; Graham *et al.*, 2013; Linn *et al.*, 2015; National Academies of Sciences, Engineering, and Medicine, 2016, 2017). Mentorship in these research experiences is especially important for providing students with structured support as they navigate research culture and learn about possibilities in STEM research careers (Linn *et al.*, 2015; Palmer *et al.*, 2015; Haeger and Fresquez, 2016; National Academies of Sciences, Engineering, and Medicine, 2019; Pfund *et al.*, 2016, 2022). As operationalized in STEM research contexts, mentorship can be conceptualized as a professional working alliance where a mentor and mentee work together over time to support the mentee's professional and personal growth (National Academies of Sciences, Engineering, and Medicine, 2019). Mentorship continues to be widely recognized as an effective means to both promote student learning and engagement in undergraduate research experiences and increase the probability that students traditionally underrepresented in STEM will pursue future career opportunities (Thiry *et al.*, 2012).

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As these initiatives continue to grow, it is important to recognize that students have multiple intersecting identities and nontraditional academic trajectories that influence how they navigate research experiences. Insufficient navigational support can compromise the quality and outcomes of these experiences and limit future opportunities in STEM fields (Lane, 2016; McGee and Robinson, 2019; Baber, 2020; Zuckerman and Lo, 2021; Burt *et al.*, 2023). It has been previously suggested that well-intended mentors may treat students from minority populations differently than those from majority populations, leading to unintended discrepancies in expectations and the quality of mentorship (McCoy, 2015).

While attention has been given to promoting more equitable outcomes in STEM for students from different identities and backgrounds (Hurtado *et al.*, 2008; Jones *et al.*, 2010; Fuchs *et al.*, 2016; Hernandez *et al.*, 2018), one group that has been largely ignored in the existing literature and in higher education reform initiatives is transfer students. Transfer students begin their trajectories in higher education at other institutions before transferring to a 4-year university. This transfer process is mostly unique to the United States and Canada, where students typically transfer from 2-year community colleges to 4-year universities. Nearly half of all undergraduate students in the United States begin their postsecondary education as community college students (Ma and Baum, 2016). This group of students is incredibly diverse, as transfer student populations tend to have a higher representation of individuals from minoritized backgrounds and identities compared with students who initially enroll in universities as freshmen (Rosenberg, 2016; Xu *et al.*, 2017). Transfer student populations typically include a higher proportion of first-generation college students, students with disabilities, veterans, racial or ethnic minorities, parents, socioeconomically disadvantaged backgrounds, and a wider span of age groups (American Association of Colleges and Universities, 2023).

In this paper, we focus on transfer students who matriculate into a 4-year university after attending a 2-year community college. Prior work has demonstrated that there may be stereotypes toward these students as “latecomers to science” because they often pursue alternative pathways before beginning their STEM education (Jackson and Seiler, 2013). There also have been documented stereotypes about transfer students’ academic preparation, which have been attributed to biases or assumptions regarding the quality of academic rigor in community colleges when compared with that of a 4-year university (Laanan *et al.*, 2010; Shaw, 2019; Zuckerman and Lo, 2021). However, it remains unknown the extent to which mentors in STEM research settings may share these preconceived notions about these students and how these assumptions may affect their approaches to mentoring these students during these research experiences.

### Trajectories for Transfer Students in Undergraduate Research Experiences

This open question regarding how mentors approach mentoring transfer students in research is important given the known inequities that transfer students face in undergraduate research experiences. Despite their substantial representation in the undergraduate population and diverse backgrounds, transfer students have lower STEM participation and persistence rates

than students who begin at a 4-year university as first-time freshmen (Wang, 2015; Lakin and Elliot, 2016; Bahr *et al.*, 2017). In a national survey on student engagement, it was found that undergraduate seniors who identified as transfer students were about half as likely to participate in research with a faculty member than nontransfer students (National Survey of Student Engagement, 2019). Furthermore, a national survey on earned doctorates found that only about 20% of all doctoral recipients in the United States were community college students at some point (National Center for Science and Engineering Statistics, 2022). These lower participation rates have been attributed to insufficient institutional support in navigating STEM career pathways as these students transfer to the university with a compressed time frame and often limited navigational resources (Packard and Jeffers, 2013; Zuckerman and Lo, 2021). Additionally, as transfer students frequently come from other backgrounds that are underrepresented in STEM, they may experience additional identity-based inequities that are perpetuated by higher education institutions (Beasley and Fischer, 2012; Palmer *et al.*, 2013; Jorstad *et al.*, 2017; Casad *et al.*, 2019).

Among these marginalizing experiences, it is crucial for mentors to recognize and celebrate the assets these students bring from their diverse backgrounds and trajectories, highlighting their resilience and unique contributions to academic and research communities. The diverse pathways that transfer students often take into higher education equip them with different types of capital that they leverage when navigating STEM research career pathways. This capital includes networks and knowledge derived from their families, communities, and community colleges, as well as prior professional experiences that can reinforce their educational and professional aspirations in STEM (Yosso, 2005; Laanan *et al.*, 2010; Rodriguez *et al.*, 2023; Rodriguez and Stevens, 2023). The unique experience of navigating the transfer process also fosters a strong sense of resourcefulness and proclivity to form meaningful support systems that are indispensable when navigating academic and research experiences (Mobley and Brawner, 2019). Understanding how to expand and leverage these assets while providing unique support that is tailored specifically to the STEM transfer experience remains critical for increasing the persistence and success of transfer students in STEM research.

Participation in undergraduate research experiences has become an important prerequisite for admission into graduate programs, with multiple years of research experience often being necessary for students to become competitive applicants who are sufficiently prepared for a rigorous, research-intensive training (Thiry *et al.*, 2012; Linn *et al.*, 2015). Studies that have examined student participation in research experiences during the first 2 years of college have suggested that students may experience a variety of positive affective and academic outcomes from this earlier engagement than if they began their research experiences later in their undergraduate education (Hernandez *et al.*, 2013; Bowman and Holmes, 2018; Hayes, 2018; Ceyhan and Tillotson, 2020). However, most undergraduate research experiences take place at 4-year institutions due to the reduced capacity to sustain research infrastructure in community colleges (Hirst *et al.*, 2014; Nerio *et al.*, 2019). Upon entrance into the university, it takes time to learn about available research opportunities. Insufficient institutional

support combined with a reduced timeframe limit the chances that transfer students have to pursue long-term research experiences and gain the skills and networks needed to become a competitive applicant for graduate school and research opportunities in STEM fields (Hewlett, 2018; Zuckerman *et al.*, 2022).

Because undergraduate research experiences often involve near-peer PhD-student mentors and faculty research advisors, mentees often find themselves in an undergraduate-graduate-faculty triad. The support provided in these mentoring relationships is instrumental in fostering stronger perceptions of science identity, self-efficacy in research skills, sense of belonging, and commitment to careers in STEM research (Hunter *et al.*, 2007; Dolan and Johnson, 2009; Chemers *et al.*, 2011; Palmer *et al.*, 2015). Although this triad offers a networking function with more abundant professional connections, like other mentorship structures, it can still result in negative mentoring experience such as absenteeism, misaligned expectations, and unequal treatment (Dolan and Johnson, 2010; Limeri *et al.*, 2019). Given the inherent time and resource inequities that transfer students already face when entering the university, tailored and cohesive guidance provided during these mentored experiences is especially important for promoting more equitable professional outcomes in research that opens future opportunities in STEM for these students.

### Examining How the Transfer Student Experience Affects Approaches to Mentorship

Recent research has focused specifically on the importance of mentorship for transfer student success in STEM. According to a report on the retention of transfer students in STEM, “when students gain mentoring in multiple contexts, they are more likely not only to persist in college but in a STEM major” (Labov, 2012, p.124). For transfer students interested in STEM careers, academic and research goals can be influenced substantially by their previous academic experiences and expectations in community college, as well as the lived experiences that are shaped by their diverse identities and backgrounds (Zuckerman and Lo, 2021). The navigational inequities that transfer students face when pursuing opportunities in STEM supports the need for mentorship experiences that holistically address the specific needs of these students while celebrating the assets they bring to the research community (Gamage *et al.*, 2022). To motivate and support students in achieving their goals in STEM, it is important to orient students toward realistic goals and expectations while empowering students to leverage their experiential realities and multiple identities (Byars-Winston *et al.*, 2015; National Academies of Sciences, Engineering, and Medicine, 2019). Fostering such experiences requires that mentors be receptive and motivated to learn about the backgrounds of their mentees, build trusting relationships, and take the time to understand how their mentee’s prior experiences have shaped their expectations and trajectories toward a STEM career pathway.

Ideally, mentorship of transfer students would focus on providing academic, professional, and psychosocial support during their reduced timeframe and leveraging the diverse lived experiences these students bring to shape their research experiences. Without this engaged mentoring, higher education institutions will continue to perpetuate inequities that undermine the

participation and persistence of transfer students in STEM research careers. Given the unique trajectories of transfer students, the known biases often held toward these students in higher education institutions, and a need to effectively train mentors to support students from diverse backgrounds, it is critical to examine how mentors approach the development of these students. This study therefore asks the following research questions:

1. How do mentors of transfer students in undergraduate research experiences reflect upon and approach the transfer student experience in their mentorship?
2. How do approaches to mentoring transfer students relate to general approaches to mentoring students from different backgrounds?

## MATERIALS AND METHODS

### Study Design

This study is a qualitative investigation of how mentors of transfer students in undergraduate research experiences reflect on their mentorship approach. We explore mentors’ perceptions of their roles in supporting research mentees from diverse backgrounds, with a special focus on how they consider transfer students’ trajectories and experiences. While we do not claim broad generalizability, we suspect that these approaches may be shared by mentors in other institutional and research settings. Because this is an understudied phenomenon in the current literature, the exploratory nature of this study design was advantageous for investigating and describing the nature of participants’ perceptions of their mentorship approaches without a priori assumptions, with the categories emerging from this study providing grounds for further exploration in future studies.

This study adopts phenomenography as the analytical approach because of its flexibility as a method for identifying qualitatively different categories that distinguish an individual’s experience of a phenomenon (Marton 1981, 1986). A core epistemological stance in phenomenography is that human behaviors are characterized by purposefulness and consciousness (Han and Ellis, 2019). This intentionality can lead to variations as individuals may experience or foreground different parts of a phenomenon, which may result in different interpretations of these experiences (Åkerlind, 2018; Han and Ellis, 2019). Because phenomenography focuses on collective meaning and variations, it is particularly suitable for identifying and understanding the different ways that mentors reflect upon the transfer student identity and experience in their mentorship approaches.

### Study Setting and Participants

This study took place at a public institution in the western United States, with “very high research activity” as classified by the Carnegie Classification of Institutions of Higher Education (McCormick and Zhao, 2005). Selected participants were mentors for students participating in a 2-year program that supported underrepresented transfer students interested in research careers. These students transferred from in-state, 2-year community colleges, with most having no formal research training experiences before entering the program. This program begins with an intensive, full-time introduction to

research in the summer before the students beginning at the university, similar to that described in Zuckerman *et al.* (2022). Following this research training experience, students are provided with guidance and funding to locate a faculty research laboratory where they engage in undergraduate research experiences for 2 years upon entering the university. Most of the research laboratories that students joined had no direct affiliation with the program (i.e. the lead faculty of those laboratories were not involved in program leadership), and the mentorship infrastructure was established independently by the personnel in each laboratory.

After joining their research laboratories, students were asked to provide the program directors with the contact information of the primary mentor of their research experience. A total of 15 mentors were sent an invitation to participate in this study via email, with 10 agreeing to participate. This sample size falls in the estimated range of participants that has been documented to adequately capture variation in phenomenographic studies (Trigwell, 2000; Reed, 2006). Mentors were contacted 3 to 6 months after the students had joined the research lab, as this was deemed to be sufficient time for students to become acquainted with the norms of the research lab, participate substantially in research activities, and form a professional working relationship that their mentor could meaningfully reflect upon.

Due to the exploratory nature of this study, comparative analysis across different demographic or background variables was not a focus. Furthermore, to preserve participant confidentiality, limited demographic information is provided due to small sample sizes in each subgroup, with the exception of gender and career stage (Table 1). To summarize, eight of the 10 mentors identified as women while two identified as men. Eight of the immediate research mentors were graduate students or postdoctoral scholars leading a major project within the research laboratory. One mentor was a staff member who was a coordinator for multiple studies in the laboratory, and one mentor was the principal investigator (PI) of the research lab. We also note that one mentor identified as a transfer student when they were an undergraduate researcher.

### Data Collection

A semistructured interview protocol was implemented as part of a larger study that examined how mentors conceptualized mentorship in undergraduate research experiences and their approaches to mentoring students from a diversity of backgrounds and identities, with the latter being the primary focus of this study. When reflecting on their experiences mentoring students in research settings, mentors were prompted to consider both the transfer student that they were mentoring and

any other students that they had mentored in the past. In phenomenographic analysis, interview data typically originate from a few key questions, with the semistructured nature of the interview allowing the interviewer to probe participants to elaborate on key aspects of their responses (Reed, 2006; Stenfors-Hayes *et al.*, 2013; Zuckerman and Lo, 2022). This study focused primarily on the following two interview questions:

1. How does a student's background influence your mentorship style?
2. How has working with a transfer student affected your mentorship style?

Additional follow-up questions were also introduced to further probe for elaboration of ideas. These follow-up questions probed participants to describe how diversity plays a role in their mentorship, provide specific examples of how student backgrounds have influenced their approach, and whether they perceived there were any inequalities that may affect student experiences.

To encourage the participants to talk freely with minimal influence, the interviewer was intentional in not reacting outwardly to participant responses throughout the session (diSessa, 2007). Before beginning the audio recording for each session, the participants were notified that they had the option to end the interview at any point if they felt uncomfortable. All participants opted to complete the full interview.

### Data Analysis

Audio recordings were transcribed semi-verbatim by a professional transcription service (otter.ai) that removed nonlexical utterances. Discrepancies between the transcriptions and the audio recordings were edited manually. The transcripts were then analyzed using qualitative coding methodologies following Saldaña (2021). To gain familiarity with the data, analysis first began with an iterative reading of the interview transcripts to generate notes and memos on salient ideas. Inductive codes were then generated by assigning short words or phrases to segments of the interview transcripts to provide shorthand descriptions and interpretations of major ideas expressed by the participants.

The coding process began after data collection was initiated, and codes were then organized into a codebook to examine all codes in aggregate across all the interview data. Multiple codes with common underlying meanings were then collapsed into single codes. Because the second focal interview question most directly addressed our research question, we reduced our analytical focus to codes directly related to this question in the phenomenographic approach. The codes applied in this segment of the interview were collated into four analytic categories by identifying linkages and aggregated meaning between the collapsed codes. These categories represented the most salient analytical insights emerging from the interview data that addressed our research question. The transcripts were further scrutinized to identify the range of variation within each category, with the variations presented in Table 2. We applied the constant comparison method as additional data were collected to refine code definitions, confirm or disconfirm conjectures, and delineate the variations within each category (Aldiabat and Le Navene, 2018).

**TABLE 1. Gender and career stage of participating mentors**

	Group	Number
Gender	Women	8
	Men	2
Career Stage	Graduate Student	6
	Postdoctoral Scholar	2
	Faculty	1
	Research Staff	1



TABLE 2. Variations identified within each category emerging from phenomenographic analysis

Category	Variations
Exposure or relationality to the transfer student identity.	<ul style="list-style-type: none"> <li>• <i>No exposure or relationality</i>: International background with no exposure to community college to university transfer process or domestic background with no relationality to transfer experience.</li> <li>• <i>Indirect relationality</i>: Nontraditional academic background allows mentor to empathize with transfer student experience.</li> <li>• <i>Direct relationality</i>: Mentor also shares transfer student identity.</li> </ul>
Perceptions of inequalities that transfer students may face	<ul style="list-style-type: none"> <li>• <i>Not acknowledged</i>: Inequalities are not acknowledged or transfer students are not perceived to face any unique inequalities than other minoritized identities.</li> <li>• <i>Partially acknowledged</i>: There are assumed inequalities that transfer students face, but the transfer experience is not well understood.</li> <li>• <i>Acknowledged</i>: Academic, social, emotional, and/ or professional inequities that transfer students may face in comparison to nontransfer students are identified and understood.</li> </ul>
Biases and stereotypes toward transfer student background and ability	<ul style="list-style-type: none"> <li>• <i>Implicit and not addressed</i>: Mentor describes an implicit bias toward transfer students and does not address bias in their approach.</li> <li>• <i>Explicitly acknowledged</i>: Mentor acknowledges biases toward community college quality or transfer student preparation.</li> <li>• <i>Explicit and leveraged</i>: Mentor actively leverages biases as a reflective tool when formulating approach.</li> </ul>
Extent to which transfer student identity is incorporated into the mentorship approach	<ul style="list-style-type: none"> <li>• <i>Ignored</i>: Transfer student identity is not readily acknowledged when reflecting on mentorship approach.</li> <li>• <i>Acknowledged, but not incorporated</i>: Mentor acknowledges and values their mentee's identity as a transfer student, but does not otherwise feel identity plays a role in approach.</li> <li>• <i>Proactively incorporated</i>: Transfer student identity plays an explicit role in the shaping of mentor's approach.</li> </ul>

While the phenomenographic approach was a decontextualized approach for summarizing major analytical insights from the second interview question (Åkerlind, 2005), individual summaries were also written for each participant to allow for a more contextualized narrative that situates these categories within the mentors' broader approaches to mentoring students from diverse backgrounds. To explore examples of how mentors described their approaches to mentoring students from different backgrounds and identities, three case studies were selected and are presented as vignettes (Yin, 2017). Vignettes are detailed cases that are used to strategically illustrate salient patterns within a qualitative sample (Barter and Renold, 1999; Flyvbjerg, 2006). As our phenomenographic analysis presents decontextualized quotes to illustrate the variations within each emerging category, the employment of vignettes contextualizes how mentors' approaches to the transfer student experience may relate to their general responsiveness to student backgrounds and identities. Participant names were replaced by pseudonyms for each vignette.

### Reliability and Trustworthiness

Several steps were taken during the data collection and analysis process to ensure that the findings are reliable. First, all interviews were conducted by one researcher (A.L.Z.), who had no prior interactions with the participants before the interview session, which was intended to minimize bias and perceptions of coercion during the interview process and allow for a more objective interpretation of the data during analysis. Second, this researcher conducted the entire qualitative analysis across all the interview data, generating and refining preliminary codes and identifying the emerging categories from these codes. The codes and categories were presented in regular meetings with the other two authors, accompanied by representative excerpts and descriptions of nuances and variations to ensure that the interpretations were defensible and appropriately grounded in the data. All disagreements about code assign-

ments or interpretations were resolved or negotiated through dialogic consensus. Reaching consensus by discussing all codes and variations allowed for greater interpretation of nuances within the data than may have been possible if only a subset of interviews were coded for interrater reliability. Finally, the research findings were presented at one regional and one national conference to communities of discipline-based education researchers. Incorporating feedback from these additional venues allowed us to further verify that our claims were sufficiently supported by the data.

We also consider our positionalities as authors to establish the trustworthiness and credibility of our findings as we acknowledge that our backgrounds and roles can influence our interpretations of the data (Lincoln and Guba, 1985; Rowe, 2014). A.L.Z. is a graduate student who had no prior interactions with the participating mentors before conducting the interviews, thereby allowing for a more objective interpretation of their approaches and reflections. S.M.L. is a teaching professor who is a core faculty member of the program supporting the students being mentored by these mentors. While he interacted with the students during program events, he had no prior interactions with the mentors participating in this study. A.L.J. is an associate teaching professor who is the co-director for the program, interacting extensively with students and providing advice and support as they joined and participated in their research laboratories. Because of her leadership in the program and familiarity with laboratories students were joining, she knew several of the mentors personally. However, she had no direct interaction with them during the study with the exception of the initial recruitment email. Her involvement in the program and prior interactions with the mentors allowed for additional contextualization of the participants' approaches and experiences while allowing for objective interpretations of the data by the primary analyst (A.L.Z.).

None of the authors were former transfer students, although A.L.Z. and S.M.L. had community college experience

during their undergraduate education. We recognize that this lack of direct experience with the transfer process brings into question our credibility in conducting this study. We acknowledged this limitation during the data collection and analysis process, recognizing the importance of continuously reflecting on our positionalities and seeking feedback to ensure that our research approach and interpretations were grounded and defensible.

### Ethical Considerations

Before conducting the interviews, each participant was asked to complete a short survey that included a consent form, which notified them that their participation was voluntary and that they had the right to withdraw from the study at any time. Before the interview session began, participants were reminded that the interviews would be confidential and that they had the right to end the interview at any time. Ethical approval was obtained from the Institutional Review Board (IRB) at the institution where this study was conducted (IRB # 800359).

## RESULTS

Here, we describe the findings from our two approaches. First, we present the categories and variations that characterized mentors' approaches to mentoring transfer students and reflections on the transfer student experience. Second, we describe three mentors in-depth using vignettes, demonstrating the varied integration of these different categories within individual participants, as well as how these categories may relate to their broader approaches to mentoring students from different backgrounds.

### Phenomenographic Analysis

Our phenomenographic analysis summarizes salient variations in how mentors reflected upon or accounted for the transfer student identity in their mentorship approach. The categories presented are a holistic representation of the emerging variations in the entire sample. While these categories are presented individually, there are also overlapping or converging ideas across one or more categories that holistically describe individual mentors' perceptions of how the transfer student identity influences their mentorship approach (Table 2).

### Exposure or Relationality to the Transfer Student Identity

Only one participant described having prior experiences mentoring a transfer student until becoming a mentor for a student in the research training program, and few had reflected substantially on their mentee's identity as a transfer student before the interview. As they were prompted to reflect on the potential inequalities that transfer students experience or how the transfer student identity affected their mentorship approach, several mentors positioned their own identities and backgrounds in relation to the transfer student identity. For example, one mentor who immigrated to the United States to pursue graduate studies described having no prior exposure to transfer students, as they stated "I'm from such a different background. I don't think [the transfer student experience] exists, really." In this participant's home country, there are no 2-year community colleges, and therefore they perceived that this limited exposure to the transfer student experience also limited their ability to account for it as a substantial factor in their mentorship

approach. In contrast, another mentor was strongly attuned to the transfer student identity because they were also a transfer student when pursuing their undergraduate studies. They felt they could fully empathize with their mentee on the process of transitioning from a community college to a university, stating that "I was also a transfer student. So, I 100% knew where they were coming from with the decision to do [community college] and then transfer and we talked about it a bit."

While only one mentor in the sample had personal experience with transferring to a university, several other mentors felt they could empathize with their transfer student mentees due to their own nontraditional academic backgrounds. For example, one mentor described that their pursuit of an undergraduate education at a later age was also shared by their transfer student mentee, stating:

[My mentee] and I kind of get that because I was pretty non-traditional, too. I didn't get my Ph.D. until I was 37. I didn't start my master's degree until I was in my 30s and [my mentee]'s a little bit older as well. So, yeah, I think we kind of understand that element of it and see eye to eye on that element.

Similarly, another mentor believed they could relate to their transfer student mentee's academic trajectory because they started their undergraduate education in what they perceived to be a nontraditional academic institution. In contrast to the previous mentor, their ability to relate to transfer students' nontraditional background was a key determinant in their mentorship recruitment efforts and philosophy driving their mentorship approach:

I came from this liberal arts and sciences background. And when I was applying for grad schools, I felt super out of place because I was surrounded by these people who were into these huge state schools or Ivy leagues or something like that. When I was looking for an undergraduate mentee, I was really interested in finding someone who had a different background because I just think that we need greater educational diversity in science.

This mentor demonstrates that sharing an experiential trait with their mentees—here, perceptions of a nontraditional research trajectory—can still lead to different mentoring approaches. Collectively, these accounts of the different levels of exposure or relationality to the transfer student identity describe how mentors' own academic or cultural backgrounds may influence how they recognize and relate to their mentee's identity.

### Perceptions of Inequalities that Transfer Students May Face

When prompted to reflect on the potential inequalities that transfer students may be faced with, most mentors acknowledged a variety of potential academic, social, or professional inequities that transfer students may face in comparison to non-transfer students. For example, one mentor described how a lack of access to a strong social network can impact a transfer students' access to research opportunities and overall wellbeing at the university:

As a transfer student, coming in as a junior, you'll know fewer people than if you came in as a freshman. ... [S]ocial networks are a big determinant of happiness, fulfillment. You know, you talk with friends about your professional aspirations, and they give you advice, because they know you better than anyone else at that stage in your life. And so, maybe marginally, that affects transfer students more than the average college student, research wise, but it's certainly an indirect mechanism.

The acknowledgment that the lack of access to important networks or resources can be “an indirect mechanism” for creating new barriers to important opportunities in academics and research indicates an awareness of the unique or disproportionate challenges that transfer students are afforded when entering the university. The inherent time constraint that transfer students face when transitioning is perceived by the mentor to perpetuate inequalities across multiple intersecting dimensions of the students' experiences and trajectories at the university. Similarly, although not intimately familiar with the transfer experience, another mentor conjectured that time constraints could potentially affect a transfer student's academic and research experiences:

Maybe it's the extra requirements to do or maybe not knowing the environment. People who have been here since freshman year had [several] different professors, and they know more about the PIs who are here that they can work with, whereas transfer students might not have that knowledge.

Some mentors chose to take a “color blind” approach to their mentee's identity as a transfer student in their mentorship approach because they perceived that students from other diverse identities or backgrounds may be facing similar challenges or barriers to opportunities. For example, as described by one mentor:

I think [the university] is such a diverse place, that even people who aren't transfer students at [the university]—you can't really make assumptions that they are highly knowledgeable or know people are well connected. Like, they're so variable in their backgrounds that I don't think it has a big impact on me. I just tried to not judge them as harshly for not yet having had certain research experiences.

This mentor acknowledges that because students are “so variable in their backgrounds,” likely due to the increasing diversity in higher education, it cannot be universally assumed that first-time freshmen do not experience equivalent hardships or challenges in their transitions or navigation through the university. Thus, this approach perceives that it is imperative to be supportive of all students regardless of their previous academic experiences. While some mentors posited that it is essential to be generally aware of and responsive to students who come from disadvantaged backgrounds, the responsiveness in their approaches may be attributed to the holistic qualities of the mentee rather than tailored to specific dimensions, such as the transfer student identity.

### **Biases and Stereotypes Toward Transfer Student Background and Ability**

While many mentors valued the opportunity to mentor a transfer student and acknowledged the inequalities that these stu-

dents may face in their academic and research trajectories, some also directly recognized or implied that they had preconceived notions about these students. Some of these biases were directed at the quality of preparation at community colleges, which they perceived may have had detrimental impacts. For example, one mentor directly acknowledged their bias toward the quality of teaching in community colleges, but also thought it was necessary to acknowledge the inequalities that transfer students face when transitioning to the university:

I think that my bias has been that in a community college you're less likely to encounter a professor that does something that really makes sure that you understand what you're memorizing and you actually learn a concept instead of just cramming and memorizing before a test and then everything sort of leaves you. ... The reason I'm talking about this is it will affect your lab work because lab work is not something that you can just sit down and memorize. It's like you have to do the thing and you have to understand the thing to become good at it so it kind of forces you to use that muscle.

This same mentor also hypothesizes how this lack of experience influences a student's experience in the lab:

The imposter syndrome is probably way higher in that group because of that. Because it's like, “Well. Why am I here then? It's like everyone else is...?”. There's this perceived [feeling that] “everyone else somehow knows and I don't.” And I've noticed it in my student and we've addressed it. Every time I noticed it, I stop it and we talk about it because it's really important to start fighting it as soon as possible.

This mentor describes how transfer students may experience imposter syndrome due to incongruities between community college and university rigor, while also describing how this observation served as an impetus for early meaningful conversations with their mentee to address self-perceptions that may negatively affect their growth. This is a case where biases were leveraged as a source of empathy toward their mentee and motivation for providing a more meaningful mentorship experience.

Mentors who acknowledged that they held biases toward transfer students' abilities or academic backgrounds also described their efforts to address and overcome these biases. For example, another mentor described their attempts to reframe their own negative impressions of transfer students' abilities by centering an example of a transfer student who they admired and perceived as successful. They believed this approach to overcoming stereotypes was applicable to students from other minoritized backgrounds:

When people are from these, like minoritized groups, or transfer students or whatever, like I certainly used to have certain impressions, but I, I try to replace those with the kind of most successful examples that I encounter. So then like, “Oh, they're like that person. Okay, let's see if they can be like that person.” For any type of kind of stereotype that I have.

This same mentor elaborated that the most optimal way to overcome their biases toward transfer students is through recruitment efforts which ignore identity and instead holistically consider students' academic performance, career trajectories,



and interests. They also qualify that this approach “is probably not helpful,” implying that ignoring transfer students’ backgrounds, challenges, or experiences could undermine their ability to provide targeted support in the mentorship experience based on that identity:

I’m aware that I used to have kind of a negative impression of transfer students, and now I don’t, but I almost just don’t want to even pay attention to that part, which is probably not helpful. Like if they sent me a CV to apply to my lab, I just try to focus on their trajectory and their interests and some of their recent grades.

While several mentors acknowledged their biases toward transfer students and their efforts to overcome them, other mentors appeared to hold more implicit biases. For example, while acknowledging that transfer students are a population that are typically not well represented in science, one mentor acknowledged their mentee as a “a college transfer student, which are, historically speaking, not academic superstars that go on to whatever.” Similarly, another mentor described the academic and social inequalities or challenges that transfer students often experience when transitioning to the university, but placed the deficit primarily on the student rather than the institutional structures that often perpetuate these inequalities:

They obviously have some similar education level, but maybe not everyone took calculus or something. So there they might have some deficits or they might have to take extra classes, which I feel like would add to the [load on] people’s plates. And then emotionally. I don’t know if they transferred without knowing anyone. Everyone’s already got friend groups, so that’d probably be a stressor. These are all things that I would imagine that they might be going through.

As this excerpt illustrates, this mentor was overall receptive to the challenges that transfer students experience in multiple dimensions of their experiences at the university, but there was no direct action to address this bias or use this perception to inform how they may better support their student to overcome these potential challenges.

### **Incorporation of Transfer Student Identity into the Mentorship Approach**

As the previous categories primarily summarize how mentors reflect on transfer students’ experiences and backgrounds, we now attend to how the mentors think these identities may or may not impact their mentorship approach, which we define as their perceived role and strategies for mentoring students. Before the interview, it seems that most mentors had not incorporated the role of the transfer student identity in their approach. While this current study is not able to elucidate whether their conceptualized approaches to mentoring transfer students align with their actual practice, we nonetheless identified variations in how they perceived the transfer student identity may have influenced their mentorship approaches.

Aligning with our observation that mentors did not reflect on their mentee’s transfer student identity before the interview, this identity—unsurprisingly—was not directly accounted for in most mentors’ approaches. Several mentors were agnostic to

their mentee’s identity as a transfer student. For example, when asked about how their mentee’s identity as a transfer student affected their approach, one mentor responded:

I don’t think it has. I mean, it seems like she’s on track with her junior year requirements. I know she’s a little bit older than a junior, so I don’t know if she had setbacks as a transfer student or not. But it hasn’t really come up.

This generally agnostic approach was also described by the one mentor who was a transfer student when they were an undergraduate. Despite sharing this experiential trait with their mentee, they perceived that their mentee’s identity as a transfer student had no effect on their overall mentorship approach, stating that:

I think the only thing that changed there was just that we were able to discuss the transfer process... I wouldn’t have been able to have that conversation with someone that started at [the university] from freshman year. But other than that, I don’t think them being a transfer really affected me.

While most mentors did not believe the transfer student identity had a direct impact on how they mentored their trainees, several mentors expressed empathy toward their mentee’s experiences and noted that transfer students have life experiences and maturity that could enrich their perspectives as a mentor. For example:

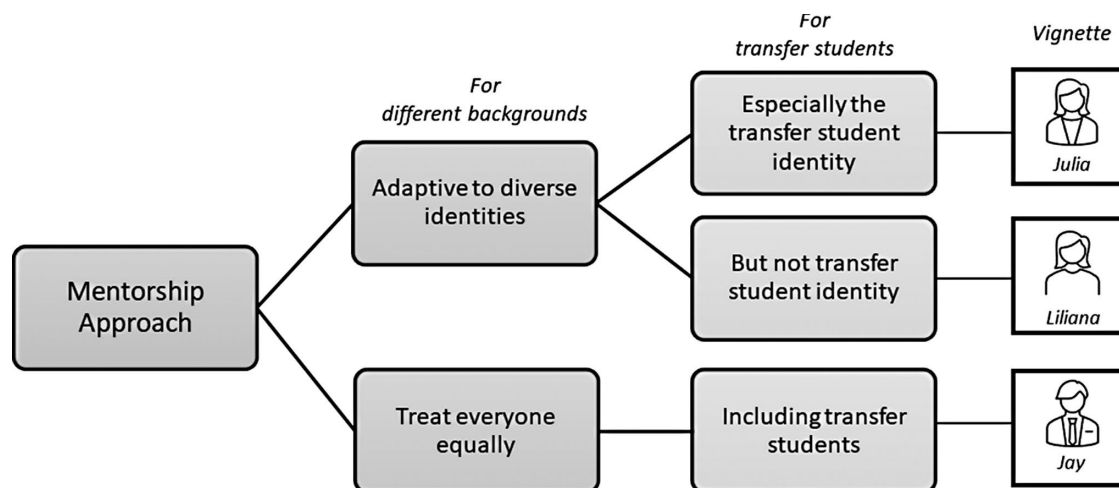
I don’t think it’s affected it too much, but it’s been really nice for me to get perspective on a transfer student’s view. This student is very mature and she just has a different view of responsibilities and what she wants to get from this experience. I’ve found it pretty rewarding just to get a chance to hear her perspective.

This sense of maturity was often derived from an understanding that transfer students typically have nontraditional trajectories into higher education, often being older than students who matriculate directly into the university as first-time freshmen. As another mentor stated:

I would guess that the age distribution of transfer students is shifted a little bit older than like the typical college junior. [Transfer students are] probably, you know, some number of years older than the typical, nontransfer college junior. And so that comes with life experience and maturity that I think are increased in transfer students.

Thus, while a majority of mentors did not consider the transfer student identity as an integral factor in the shaping of their mentorship approach, their approaches could still be distinguished based on whether they acknowledged or affirmed their mentee’s identity as a transfer student when reflecting on the nature of their mentor-mentee relationship.

The exception to these generally agnostic approaches to mentoring transfer students was exemplified by two mentors who proactively considered their mentee’s identity as being central to how they cultivated their approach. For example, one mentor attended extensively to the time constraints



**FIGURE 1.** Approaches to mentoring students from different backgrounds. Three vignettes are presented to illustrate how mentors may approach mentoring students from different backgrounds and how this relates to their approaches for mentoring transfer students.

that transfer students experience during their transition to academics and research at the university. Recognition of these constraints prompted them to be proactive about providing information to their mentee about resources and opportunities that they may not have otherwise had access to during their transition:

If there's any organization that I am on an email list for that I think that I think is—that I think might—even if it's tangential, I forward them basically all information that I get and all resources that I get just to be like, “There’s a lot of things out there. Does any of this sound cool?” That. That is just the number one thing. Sharing information and that is big. Giving people opportunities.

The other mentor who fit into this more proactive categorization articulated that their mentee’s identity as a transfer student was a significant motivating factor for recruiting them into their research lab. They recognized the diverse experiences and perspectives that transfer students could bring to enrich the field of scientific research and how this could simultaneously break rigid stereotypes of successful pathways in academia:

I was really interested in finding someone who had a different background because I just think that we need greater educational diversity in science. We need greater diversity, period. But one of the branches that we need more diversity is through something like transfer students. I want people to be able to look at professors 20 years from now and not say like, “Oh. Well, yeah, of course, they went to Harvard and they went to Yale and they went back to Harvard.” I want them to look at it and be like, “Oh. They came from SDSU and then they went to the University of Iowa and then they went to Harvard or something like that.” So I guess I would say having a transfer student was always kind of in my prerogative [as] someone who had a different education background than a lot of people.

This mentor goes on to highlight the benefits of working with their mentee and how it has shaped their mentorship approach:

I really love having someone who’s a transfer student. I think they have—I think [student] has an incredible determinism. I think she has incredible independence. And yeah, if anything, it’s maybe more relaxed with my mentoring. So I’m like, “Oh.” Like, “You’re already so good.”

This mentor’s acknowledgment of their mentee having “incredible determinism” and “incredible independence” is reflective of their asset-based orientation toward their mentee’s identity as a transfer student. Although they described themselves as being “more relaxed with [their] mentoring” because of these qualities that reflect maturity and independence, they thought that their mentee’s identity and agency had an overall positive influence on their approach.

#### Vignettes: In-depth Descriptions of Three Mentors

Given these emerging categories that collectively describe the variations in how mentors understood the role of the transfer student identity in their approach, we now holistically situate these categories within individual mentors’ philosophies and approaches for mentoring students from different backgrounds. Doing so allows us to identify how these approaches may converge or differ with how they respond to the transfer student identity. Because these categories were derived inductively rather than directly probed for in the interview protocol, not all categories will be present in each vignette. We present these vignettes as representative accounts of how three mentors articulated their approach to mentoring undergraduates in their research labs (Figure 1). While there are no current data to triangulate how these approaches are enacted in practice, we were able to identify variations between how their perceived approaches to mentoring students from diverse backgrounds and identities relate or diverge from their approaches to mentoring transfer students.

#### Vignette 1: Responsive to Diverse Identities, Especially the Transfer Student Identity

This first vignette will describe Julia as an example of a mentor who attends to various diverse identities in her ideation about

mentorship and is especially responsive to the transfer student identity<sup>1</sup>. Julia is a graduate student whose motivation for being a mentor comes from the intrinsic motivation to do something good for the world. She does not expect any certain outcome as long as it helps the trainee realize their values and what they want in life. She feels that she has had mentors in the past who have helped her in this regard and thus she wants to pay meaningful mentorship forward in her lab.

Julia has worked with several students from backgrounds not well represented in science and immediately attends to her transfer student mentee as one of these students. In her approach to mentoring students from diverse backgrounds, she perceives that it is important to be sensitive and relatable in all interactions, as well as understanding of other life commitments and pressures. She wants to be supportive but also is cognizant that conversations about diversity and identity can bring uncomfortable power dynamics. Her goal is to empower the mentee to communicate with her to whatever extent they are comfortable but also help them recognize that they do not need to suppress who they are in the research experience, stating that “I’ve made it a point to learn who the people are and find out what they are good at naturally and sort of build their experience on that instead of making them suppress who they are.” In recruiting students for her research lab, she has recognized the importance of using a holistic approach to rating diverse applicants, taking into account students’ other responsibilities and not just grades. She also believes retention is just as important as recruiting and that it is important to maintain an environment that fosters a sense of belonging for trainees.

Julia perceives that sensitivity and understanding are particularly needed for transfer students, as her mentee has expressed the difficulties they have faced in making a big academic transition from community college to university. She is empathetic to students who may face imposter syndrome when transferring to university and proactively addresses this with her transfer student mentee. Because of assumed incongruities in difficulty between community college and university, she perceives that students may be unprepared or have incompatible beliefs about academic and research norms in the university. However, she is also cognizant of not being dismissive to their beliefs as she does not want to discourage students who are already facing immense challenges in this academic transition, stating that “I don’t want to be sort of dismissive of what they perceive to be [important]. For somebody to just come and be like, ‘that doesn’t matter,’ when you’re pouring all your energy and work into it, that can be discouraging.” Aligning with her general approach to empower her mentees, she adopts a more asset-based approach where she builds the mentorship experience around her mentee’s individual goals and identities in a way that does “not squash who they are, [not] force them to hide things of what they are and helping them do it their way.”

She also acknowledges that transfer students do not have the same timeline as first-year students to get acclimated to the university, as transfer students “go into a place [where] everyone’s already had 2 years to sort of get comfortable.” To support her transfer student mentee’s professional development in her research lab, she tries to share as many resources and

networking opportunities as possible so they feel supported and have multiple sources of navigational support as they carve out their professional trajectories, as she “always has them in mind” and puts forth an effort to “try and connect them with as many people as [she] can.”

### **Vignette 2: Responsive to Diverse Identities, but not the Transfer Student Identity**

This vignette will describe Liliana as an example of a mentor who attends to various diverse identities in her ideation about mentorship, but not the transfer student identity. Liliana is a graduate student who did not complete her undergraduate degree in the United States. In her mentorship approach, she states that she is quite direct, but realizes that being direct is often conflated with being unapproachable in the United States. Based on feedback from her mentees in previous laboratories she has worked, she has tried to become more patient and less forthright, but also acknowledges that her mentorship approach is a constantly evolving process.

She describes herself as excited to mentor students with various identities because she believes that diversity confers creativity and teamwork. She sees that there could be a multitude of barriers that students face for pursuing opportunities in research. She recognizes inequalities across multiple dimensions of identities, such as first-generation students not having access to important resources and opportunities, students with disabilities facing medical barriers, students from socioeconomically disadvantaged backgrounds facing financial challenges, and female students facing gendered stereotypes about their STEM abilities. Aligning with her desire to become more patient as well as her experience as a foreigner, she believes that thoughtful and deliberate communication and tailored accommodations are helpful for supporting diverse trainees.

However, despite this multifaceted conceptualization of diversity and identity, Lilliana does not attend to the transfer student identity in her mentorship approach. She is unfamiliar with the transfer process because transfer students do not exist in her home country. Nonetheless, she does not perceive that students face any additional barriers due to their identities as transfer students, stating that “I have so limited data to compare to. It doesn’t seem to me that being a transfer student is really limiting as much as other things we’ve talked about.” Because transfer students have 2 years at the university and first-year students may not join a lab until later in college, she perceives that there are no additional time constraints that transfer students face.

### **Vignette 3: Equal Mentorship for All, Regardless of Identity**

This vignette will describe Jay as an example of a mentor whose approach is to treat all mentees the same, regardless of background or identity. Jay is a postdoctoral scholar in a laboratory that he describes as very “science-oriented” and team driven, where everyone is “kind of mentoring each other.” In addition to laboratory tasks, he describes that his role as a mentor is to provide insights on how to navigate various career trajectories.

He believes that his mentorship style is a balance of laid back and rigorous—he knows that academia can be a caustic environment and wants his mentees to be prepared but “not take it too seriously.” He tries to be firm in his deadlines, but also understanding whether challenges arise and whether others

<sup>1</sup>In this vignette, she/her pronouns are used to refer Julia while they/them pronouns are used to refer to her mentee(s).

have outside obligations. He sees the “aha moments” that his mentees have as rewarding and believes that the research experience is rewarding to the mentee when they have a tangible product to show for their work.

When reflecting on the backgrounds of the students he has worked with, Jay’s approach is to treat everyone equally, promote togetherness, and be welcoming to all. He is cognizant of the inequalities that underrepresented students have faced, but students’ backgrounds play little role in his mentorship approach due to his desire to treat everyone equally. Still, he does describe the desire of his laboratory to recruit students from a variety of backgrounds but sees the accommodations for diverse researchers to be more at the faculty level rather than under his influence: “it’s a question that’s a little higher up the food chain.”

Jay considers himself to have a nontraditional trajectory in academia because he pursued graduate studies at a later age and thus sees more “eye to eye” with his mentee’s identity as a transfer student. His student is a bit older than the typical undergraduate student, so he appreciates the wisdom and drive that being older can bring to the research experience. However, like his general approach to mentorship, he does not perceive that this identity has any additional impact as he “[tries] to really just go above and beyond for everyone, and really just make sure that anybody that is being mentored in our lab, that they have everything they need.”

## DISCUSSION

The existing literature on mentorship in STEM research settings has largely focused on the effects of mentoring relationships on mentee’s affective dispositions and skill development in their research experiences (Haeger and Fresquez, 2016; Pfund *et al.*, 2016; Thiry *et al.*, 2012; Byars-Winston *et al.*, 2015; Estrada *et al.*, 2018; Atkins *et al.*, 2020). More recent studies have examined motivational aspects underlying how student identities and backgrounds may shape a mentor’s approach, such as the mentor’s awareness of cultural diversity (Byars-Winston and Butz, 2021) and motivation to address race and ethnicity (Felder and Barker, 2013; Butz *et al.*, 2019; Byars-Winston *et al.*, 2020; Pfund *et al.*, 2022). Building on this work, here we examine how the transfer identity affects perceptions of mentorship approaches and document how mentors’ perceptions of students’ backgrounds influences their relationship with their mentee. Our emphasis on how the transfer student experience and identity is situated within these approaches informs programmatic initiatives and institutional interventions to increase the recruitment and retention of transfer students in undergraduate research experiences.

Transfer students may experience inequities in pursuing STEM research careers without engaged mentoring, especially as time constraints and limited institutional support place them at an inherent disadvantage for navigating meaningful resources, social relationships, and opportunities when transferring to university (Flaga, 2006; Owens, 2010; Zuckerman and Lo, 2021; Zuckerman *et al.*, 2022). We find that research mentors vary in their understanding and exposure to the transfer student identity and may have preconceived notions of the transfer student experience. In addition, mentors in our sample had limited preparation and training for holistically supporting transfer students in their academic and professional development. These findings indicate that the unique needs and backgrounds of

transfer students may not be given enough attention in mentored research experiences, which could compromise the quality of such experiences and limit the progression toward more equitable professional outcomes in STEM for a large and marginalized population of undergraduate students.

## Mentors Differ in Their General Responsiveness to Student Backgrounds in Their Approaches

As illustrated in our vignettes, mentors varied in how they acknowledged and leveraged student backgrounds and identities in their approach. Most mentors demonstrated at least some responsive qualities, such as relating to their mentee’s personal background or spending time getting to know and empathize with their mentee’s background and social identities (Gay, 2010; Lindsay Dennis *et al.*, 2011; Sanchez *et al.*, 2014; Byars-Winston *et al.*, 2015; Haeger and Fresquez, 2016). Previous work has demonstrated that mentors who share values and dispositions with their mentees may have more productive working relationships (Haeger and Fresquez, 2016; Pedersen *et al.*, 2022). There is also evidence that affirmation of students’ identities and backgrounds can coincide with the development of critical thinking skills and adoption of diverse perspectives within an applied science setting (Lindsay Dennis *et al.*, 2011; Hofstra *et al.*, 2020).

However, in our sample, mentors who felt they could relate to their mentee’s identity as a transfer student described these shared values and dispositions as generally limited to side conversations with their mentee rather than an as an integrated component of the research experience. Relatedly, there were also cases where mentors described an approach that was agnostic to their mentee’s backgrounds or did not provide concrete instances of how this background directly influenced decisions made to support their mentee’s professional development. The perception that equal treatment creates a more welcoming ambience (as illustrated in Jay’s vignette) suggests that some mentors may perceive differential approaches to mentorship as being discriminatory or noninclusive.

While striving for equitable outcomes for all mentees is imperative for increasing participation and retention in undergraduate research experiences, we contend that an agnostic or universal approach to student background may deprive mentees of a comprehensive mentorship experience that affirms and leverages their lived experiences (Prunuske *et al.*, 2013; McCoy *et al.*, 2015; Butz *et al.*, 2019; Atkins *et al.*, 2020). A responsive approach would ideally cultivate a space where mentees can capitalize on their experiences and perspectives without feeling a need to suppress who they are to conform to hegemonic norms or stereotypes of the research community (as described in Julia’s vignette). This type of approach is especially important as transfer students bring unique assets to the STEM research community through their diverse lived experiences and intersecting identities. Conversations about cultivating high-impact research experiences would benefit from strategies that support the identities and holistic social-emotional growth of students from different backgrounds and identities while still attending to the unique trajectories of transfer students.

## Different Perceptions of Transfer Students Compared with Other Identities

A salient dichotomy that emerged in our findings was that some mentors attended to the inequalities faced by students from



other minoritized identities (e.g. first-generation college students, racial/ethnic minorities, students from socioeconomically disadvantaged backgrounds) but did not perceive that similar or unique inequalities were manifested in transfer student populations. This perception was articulated primarily when comparing transfer students to first-time freshman populations, which both include students from diverse identities and backgrounds. One interviewee even suggested that transfer students do not face any additional time constraints because first-time freshmen do not typically pursue research opportunities until later in their undergraduate studies, thereby treating the time that transfer students lose at the university due to their abridged timeline as negligible. This perception misses the growing research on the advantages of early college university research experiences that transfer students do not have access to (Hernandez *et al.*, 2013; Hanauer and Dolan, 2014; Bowman and Holmes, 2018; Ceyhan and Tillotson, 2020; Gamage *et al.*, 2022).

None of the mentors in this study received training on how to support transfer students as research trainees nor deeply reflected on how their mentee's identity as a transfer student could affect the mentee's experiences in research. As suggested by Liliana's vignette, many mentors in the globalized world of STEM may not be familiar with the transfer student experience. Although community colleges and similar 2-year institutions exist outside of the United States, they carry different cultural considerations and may not be as prevalent in the educational system (Raby and Valeau, 2009). Individuals who are not privy to this system may therefore have limited awareness of the unique challenges and constraints that transfer students in the U.S. face when transitioning to university. Given that innovation in STEM fields is global and many researchers immigrate to pursue research opportunities in the United States from countries without a community college system, a substantial number of professional researchers may have minimal familiarity with the transfer process and associated challenges when navigating the transition from community college to university. STEM intervention programs that focus on mentorship for transfer students should therefore consider informing mentors about the inequities specifically experienced by transfer students, especially those from community colleges.

However, even some of the mentors who were able to relate to their mentee due to their own identity as a transfer student or nontraditional academic background did not incorporate this shared identity into their mentorship approach. It cannot therefore be assumed that exposure or relationality to the transfer experience will predict whether a mentor will leverage this shared experience as a reflective or instructional tool, especially for mentors who strive to use universal approaches that aim for experiences equal in quality for all mentees. Previous work has shown that students value mentors who they both identify with based on demographic similarity or shared values and who can provide a rigorous research training experience that promotes growth and development (Atkins *et al.*, 2020). Because recognition is an important component of developing a strong science identity (Carlone and Johnson, 2007; Thompson and Jensen-Ryan, 2018), mentors who recognize and leverage their mentee's identity to inform how they approach the mentor-mentee relationship can better cultivate a meaningful research experience for their mentee. Structured research

programs such as the one participated in here can indeed serve as facilitators for this recognition but should not be necessary for mentors to recognize students who do not fit a preconceived mold (Thompson and Jensen-Ryan, 2018).

### **Proposed Strategies for Supporting Transfer Student Success in STEM Research**

It is essential to increase mentor awareness of the inherent time constraints, institutional marginalization, and intersectional experiences that have perpetuated inequitable outcomes and participation rates in STEM research fields for transfer students but also celebrate the many assets these students bring from their unique trajectories (Zuckerman and Lo, 2021). A core recommendation is for mentorship ecosystem participants to recognize that identities—as well as educational trajectories—can shape career development and thus are important considerations for effective mentorship (National Academies of Sciences, Engineering, and Medicine, 2019). It is evident from the current findings as well as existing literature that the transfer student identity is not universally recognized as a marginalized identity in STEM—even well-intentioned mentors who are empathetic to the inequities faced by marginalized groups may attend to only a select group of identities. Interventions for promoting retention and persistence in STEM are often designed to target different social identities, yet few programs and initiatives focus specifically on transfer students (Zuckerman *et al.*, 2022). The transfer student identity may need to be better foregrounded in these conversations, with a need to highlight the resilience and perseverance these students bring to the STEM community despite the institutional inequities they face.

Several mentors in this study partially acknowledged that transfer students may experience a lower sense of belonging due to fewer opportunities to build important networks or resources resulting from the abridged timeline they have at the university. While these comments generally reflect an understanding of the inequities associated with the transfer experience, some of these comments were framed through deficit assumptions of student challenges rather than focusing on how institutional structures may perpetuate barriers and inequities (Smit, 2012). Previous research on deficit mindset has shown that the negative “othering” of students can reinforce feelings of imposter syndrome, thereby reinforcing the importance of asset-based approaches that welcome, value, and leverage the experiences and contributions of these students (O'Shea *et al.*, 2016). Interestingly, few interviewees acknowledged the strengths that transfer students may bring in their social networks. For example, those transferring from local community colleges may have a strong local support network from family or friends. As alluded to in Julia's vignette and by several other mentors who acknowledged the maturity and diverse life experiences of transfer students, it is important to consider the capital that transfer students already possess and explore ways to leverage it strategically during the research experience (Yosso, 2005; Mobley and Brawner, 2019).

For transfer students pursuing research opportunities, it is essential that institutional and research settings cultivate spaces where mentors are trained to invite their mentees to reflect on how their identities and experiences have shaped their academic and career trajectories. Taking the time to recognize and leverage the mentee's identity and experiences as transfer students



could be an explicit microaffirmation that provides validation, fosters a stronger sense of belonging, and positions the mentor to take on an advocacy role for their transfer student mentee (Estrada *et al.*, 2019; National Academies of Sciences, Engineering, and Medicine, 2019; Atkins *et al.*, 2020; Stelter *et al.*, 2021). Social-emotional mentoring has been associated with stronger perceptions of science identity (Robnett *et al.*, 2018). Approaching the mentorship relationship with compassion and empathy (Estrada *et al.*, 2018) and taking the time to identify how a mentee's background and experiences can be leveraged as assets in the mentorship experience may be a productive strategy for cultivating trust and shared responsibility in the mentor-mentee relationship. This stronger social-emotional bond would ideally serve as the foundation for orienting the mentee toward realistic goals and expectations in their academic and research endeavors while also affirming and valuing the lived experiences they bring to the research community. Discussing previous experiences and expectations at community college and how these have shaped their navigation through the transfer process could be additional components of early conversations that build trust in the mentoring relationship and help the mentor understand their mentee's trajectories and operational frames of reference as they begin their research experiences.

In addition to providing psychosocial support, it is equally important for mentors to consider inclusive practices that also focus on the academic and professional growth of their mentees (Haeger and Fresquez, 2016; National Academies of Sciences, Engineering, and Medicine, 2019; Atkins *et al.*, 2020; Stelter *et al.*, 2021; Pfund *et al.*, 2022). Effectively providing this support requires an understanding of the mentee's future goals, especially as they relate to their prior educational expectations and experiences in community college. For mentors who may not have direct experiences with community college or the transfer process, it becomes important to consider other networks and resources that can be leveraged to fill these potential gaps and advocate access for these resources on behalf of their mentee. For example, transfer students may struggle to identify a clear academic path given the mismatch between community college courses and introductory courses at the university. To address this, mentors can proactively connect students with academic offices on campus that can advise on this coursework.

Efforts to sustain an inclusive and supportive space for mentees who are transfer students could also include invitations to other individuals and associations within and outside of the immediate research laboratory who can provide complementary resources and networks that support the needs and goals of transfer students (National Academies of Sciences, Engineering, and Medicine, 2019). Facilitating talks, seminars, and informal networking opportunities that invite professionals from diverse backgrounds, including those who experienced the transfer pathway, could be a plausible strategy for providing transfer students with both the psychosocial and career support that is essential to their holistic development in their mentorship experience (National Academies of Sciences, Engineering, and Medicine, 2019; Craig *et al.*, 2020; Margherio *et al.*, 2020; Chavarria and Knox, 2023).

## LIMITATIONS AND FUTURE DIRECTIONS

This study has several limitations, which have also inspired directions for future research. First, our sample is limited to

10 mentors from a narrow range of STEM disciplines at one university. While our sample represents mentors from a variety of career positions, sociodemographic identities, prior mentorship experiences, and academic backgrounds (including an international student, a former transfer student, and individuals with nontraditional academic backgrounds), we cannot make meaningful distinctions between these characteristics based on this limited sample. Future work that includes purposeful and comparative sampling with expanded populations across different institutional contexts will be important for deducing how these factors or characteristics influence approaches to mentoring students from different backgrounds, including transfer students.

Second, the transfer students being mentored by these individuals were participating in a program that provided them with considerable navigational support and resources when transitioning to the university and finding a research laboratory. Because these students received mentorship through the program and received more support than the typical transfer student, mentors may have felt that they did not need to address this aspect of the student's experience. It is possible that mentors who are training transfer students with limited navigational resources may respond and adapt their approach to accommodate their mentee in ways that may not be manifested in the current sample.

Third, the current study relies on self-reported descriptions of each mentor's approach, but it is unknown the extent to how these approaches are aligned with their practice. A closer examination of the (mis)alignment between approaches and practice would be especially informative for understanding how enactment of mentorship practices can be enabled or constrained by various contextual, intrapersonal, and interpersonal factors within the research environment. For example, there may be a division of labor between mentors and higher-ranked researchers within the research lab (e.g. PIs) that may cause them to feel powerless or limited in their resources to mobilize their mentorship approaches. It will therefore be important to examine the mentorship ecosystem to understand how various stakeholders or structures beyond the control of the immediate mentor can shape the quality of the approach and how this approach is enacted in practice. Most mentors in this study were graduate students and postdoctoral scholars, so triangulating interviews with the PIs can be used to understand how mentorship approaches may be situated within the broader vision and values communicated within a research lab.

Fourth, this study does not directly examine how philosophies or approaches to mentorship are shaped and contextualized by a mentor's own mentorship experiences. It would be worthwhile to investigate how mentors' prior experiences being mentored in their own undergraduate research experiences as well as in their current research lab influence their approach to mentoring. An understanding of how personal mentorship experiences are integrated, revised, or adapted into approaches could be informative for understanding how values and philosophies are perpetuated or resisted. Insights into how mentorship approaches are passed down through generations could illuminate why there may be variations in awareness of or in decisions to integrate inclusive and responsive mentorship approaches.

Fifth, the current narrative is missing the voices of the students being trained by these mentors and there may be disparities in their perceptions of how their approach is enacted or its outcomes. Several mentors also held deficit assumptions of challenges faced by transfer students, so including student voices would be particularly powerful in challenging these assumptions and foregrounding the assets that these students bring. Relatedly, while many of our interview questions probed mentors to consider how student backgrounds influenced their mentorship approach, future work would also benefit from more direct inquiries into mentor's perceptions of their mentee's assets. For mentors who describe their approaches as responsive and affirming to their mentee's backgrounds and identities, it is especially important to investigate whether mentees also perceive that this approach validates and empowers their identities and lived experiences. Improvements in training initiatives cannot be fully realized without leveraging the voices of both mentors and mentees in the mentorship experience and reconciling potential disparities between perceptions of that experience.

Finally, different affective, cognitive, and skill-based measures could be triangulated in future studies to understand how different mentorship approaches affect student outcomes in the research experience. There continues to be a call for new research that explores differential benefits of research experiences for different social identities (Haeger and Fresquez, 2016), and this current study highlights the relevance of including the transfer student identity in those research initiatives. Investigating trainee outcomes such as self-efficacy, sense of belonging, research participation, research skill gains, and career preparation and how these outcomes are mediated by different approaches could further inform training initiatives that support comprehensive mentoring experiences for students from diverse social identities, including transfer students.

## CONCLUSION

The findings from this study demonstrate variations in how mentors in undergraduate research experiences acknowledge and integrate the transfer student experience and identity in their approach to mentorship. These variations can potentially be attributed to different levels of exposure and relationality to the transfer student experience, awareness of the inequities that transfer students face in their pursuit of higher education, or preconceived notions and biases about these students. As reform initiatives in professional mentorship training continue to emphasize the importance of inclusive mentorship approaches that are welcoming to diverse social identities and experiences, our findings suggest that the transfer student experience may need to be better foregrounded in these conversations. Because transfer students are a large and diverse population of undergraduate students, the progression toward more equitable professional outcomes in STEM cannot be fully realized without targeting more supports to transfer students' educational and research pursuits while affirming their lived experiences and identities. Thus, trainings and partnerships that increase awareness of the transfer student experience and offer strategies for supporting these students in their academic and professional goals can position research mentors as stronger advocates and role models for their transfer student mentees.

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