Growing Graduate Mentors Through a Summer Intensive Research Institute

Prof. Tryphenia B. Peele-Eady Ph.D., University of New Mexico

Dr. Tryphenia B. Peele-Eady (Ph.D., Claremont Graduate University) is a Professor in the Department of Language, Literacy, and Sociocultural Studies (LLSS) in the College of Education and Human Sciences at the University of New Mexico, where she specializes in African American education and qualitative research methods. She holds a secondary appointment in the Department of Anthropology and is an affiliated faculty member in Educational Linguistics and the Department of Africana Studies. She has served as Chair of her department and Associate Dean for Equity, Inclusion, and Faculty. Dr. Peele-Eady's research examines African American students' learning and identity formation and, more broadly, the social, cultural, and linguistic contexts of teaching and learning. Her publications appear in several peer-reviewed journals and edited books, including the International Journal of Qualitative Studies in Education, the Anthropology and Education Quarterly, and the Handbook of the Cultural Foundations of Learning.

Prof. Tahira Reid, Penn State University

Dr. Tahira Reid Smith (publishes under "Reid") is a Professor at Pennsylvania State University in Mechanical Engineering and Engineering Design, the Arthur L. Glenn Professor of Engineering Education, and the Associate Department Head for Inclusive Research and Education in Mechanical Engineering. She is also a co-founder of Black in Engineering. Her research involves the quantification and integration of human-centered considerations in engineering systems and/or the design process. Her research program has received funding from the National Science Foundation, Procter & Gamble, the Air Force Office of Scientific Research, and many others. Her projects that involved the intersection of diversity and mechanical engineering have been featured in media sources including National Geographic, NBC's Today Show, Essence Magazine, Reuters, National Public Radio and many others. A highly sought out role model for the younger generation, Dr. Reid Smith's story about her double dutch jump rope invention is featured in two children's books and was on the 2017 New York State English and Language Arts Common Core Exam administered to over 100,000 4th graders in the state of New York. In March 2024, her work and story was included in the Smithsonian Museum of Natural History's "Game Changers/Cambia Tu Juego" exhibit. Dr. Reid Smith obtained BS and MS degrees in Mechanical Engineering from Rensselaer Polytechnic Institute and a Ph.D. in Design Science, from the University of Michigan - Ann Arbor.

Dr. Lizandra C. Godwin, University of New Mexico

Dr. Lizandra C. Godwin is an assistant professor in the Electrical and Computer Engineering Department at the University of New Mexico. Her research focuses on materials development (metals, dielectrics, phosphors) for advanced manufacturing processes, process optimization for microelectronic devices, biomaterials, and broadening participation in engineering through engineering education research. The focus of her inclusive, multi- disciplinary lab is to create material solutions for a more sustainable and earth conscious future. Dr. Godwin earned her M.S. and Ph.D. degrees in Materials Science and Engineering from the University of Florida where she focused on phosphor development and degradation. Her B.S. is in Mechanical Engineering from Florida Agricultural and Mechanical University. In addition to her academic experience, Lizandra has worked for many companies including Intel Corp. and The National Aeronautics and Space Administration.

Growing Graduate Mentors Through a Summer Intensive Research Institute

Abstract

Graduate student mentors play a crucial role in engineering research and education. To illustrate, they are often called upon to assist faculty and programming with various tasks such as training and supervising mentees, organizing activities, and managing programmatic logistics. Although graduate students frequently serve as mentors, especially in programs that serve undergraduates, few studies have explored their perspectives on mentoring or how these beliefs translate into their mentoring practices. This is our focus in this paper. Specifically, we draw on data from a larger NSF project and qualitative interviews with five graduate student mentors about their mentoring experiences in a summer intensive research institute (SIRI). Results show that graduate student mentors in SIRI utilized culturally responsive approaches to frame their thinking about mentoring and drew on their awareness of intersecting identities as presented in the Academic Wheel of Privilege (AWoP) to promote empathy, perspective-taking, and greater social sensibilities among the students they mentored, especially in mentoring students from historically underrepresented and marginalized groups. Finally, we discuss the implications these findings have for preparing graduate students to mentor in higher education settings.

Keywords: Graduate Student Mentor, Engineering Education, Culturally Responsive Pedagogy and Practices, *Academic Wheel of Privilege*

Introduction

Graduate student mentors play a crucial role in the professional and personal growth of undergraduate engineering students, particularly due to the limited availability faculty have for one-on-one interactions with them [1], [2]. Among the array of tasks they take up in their roles, graduate student mentors are known to provide direct training and support to their undergraduate student mentees, function as midlevel managers between the students and the faculty, operate as supervisors, model collaboration, and provide experiences that influence undergraduate students' academic trajectories and career outlook [2], [3], [4], [5].

Unlike other forms of mentoring, graduate student mentoring often lacks guidance or formal training [6], [7], [8]. Despite this, however, the impact of graduate student mentoring is critical to their mentees' future academic and career trajectories [4], [9]. Much of the research literature has reasoned that two main goals of effective graduate student mentoring in engineering education are guiding undergraduates in technical research and laboratory techniques and providing mentees with social support [3], [9], [10]. These goals hold true for graduate students and postdoctoral researchers who also serve as research mentors in university settings [9].

Several research studies show that mentoring benefits both graduate student mentors and the students they mentor. These gains include but are not limited to improved mental health and increased propensity toward success [6], [9], [11], [12]. Undergraduate students from historically marginalized backgrounds credited their success to graduate mentors who provided information systematically, explained content to them multiple times, and helped them find answers to questions they were passionate about investigating [5], [13]. Similarly, mentoring has shown to be mutually beneficial to graduate students, providing them with on-the-job training that helps prepare them for careers in academia, as postdoctoral fellows, and as faculty

members at universities [6], [14]. Thus, training as well as personal mentoring experiences shape the ways graduate students come to approach their mentoring practice [6].

Other studies have noted some key challenges associated with graduate student mentoring [8], [15]. For one, graduate students struggle to balance the time commitments necessary for a structured training program with coursework and other academic program requirements. Further, we must consider the ethical concerns and risks associated with graduate students mentoring undergraduates due to the power differential that arises from the differences in their levels of development and life experience. Despite these concerns, however, most scholars agree that having graduate students mentor their undergraduate peers is good practice that enhances the overall learning of mentees and the graduate students themselves [6]. As such, more focus on graduate student preparation to mentor and their mentoring practices is more pertinent than ever.

In this paper, we examine graduate student mentoring from the students' perspectives and in the context of a summer research component of a larger multi-university cyber-physical systems (CPS) research project. The Summer Intensive Research Institute (SIRI) aims to enhance diversity in engineering and cyber-physical systems research.

We address the following research questions:

1. How do graduate student mentors in SIRI understand and talk about mentoring?
2. What conditions support graduate students in their mentoring practice?
3. How do graduate student mentors perceive themselves and the undergraduate students they mentor in relation to academic privilege dimensions?

Central to our analysis are the ways graduate students both shape and are shaped by their mentoring practices. By this, we mean what graduate students consider critical components of good mentoring against a backdrop of culturally responsive pedagogies and how being a mentor in a program like SIRI has influenced their practice.

Theoretical Perspective

Two main perspectives comprise the theoretical framework for this paper: the Academic Wheel of Privilege [16], [17] and culturally relevant [18] and responsive pedagogy [19]. The Academic Wheel of Privilege (AWoP) is a conceptual framework created to capture how identities intersect across several domains and how those identities impact privilege in academia and society (see Figure 1). The AWoP draws upon the work of two other scholars, Sylvia Duckworth (Canadian Council for Refugees, https://ccrweb.ca/en), who leveraged the intersectionality work of Kimberly Crenshaw [20]. The framework consists of 20 categories that describe both visible and invisible identifiers that make people *diverse*. These twenty categories are clustered into seven sub-categories: living and culture, caregiving, education and career, gender and sexuality, race, health and wellbeing, and childhood and development. These intersections create a funnel-like appearance whereby the closer an individual is to the center of the wheel, the more privilege they are likely to have [17].

Reid guided the graduate student mentors through an AWoP reflection exercise after the 2023 SIRI session concluded. Students had to choose the identities that resonated with them the most

and then reflect on whether their life experiences aligned with the categories described. Students then had to consider alignments with people with identities different from their own and those indicated in the AWoP. We asked the students to reflect on the exercise and comment on how the *Academic Wheel of Privilege* can help graduate students engage with undergraduates as mentors.

Several researchers have used the AWoP as a tool – to determine authorship on publications and examine positionality [17], [21], to develop a framework for describing the learning privilege divide [22], and to understand how racism operates in different fields, such as in medicine [23]. We used the AWoP to highlight the identity types that bode well with the tenets of culturally relevant and responsive teaching [18], [19] – particularly, having high expectations and commitment to community and establishing meaningful relationships.

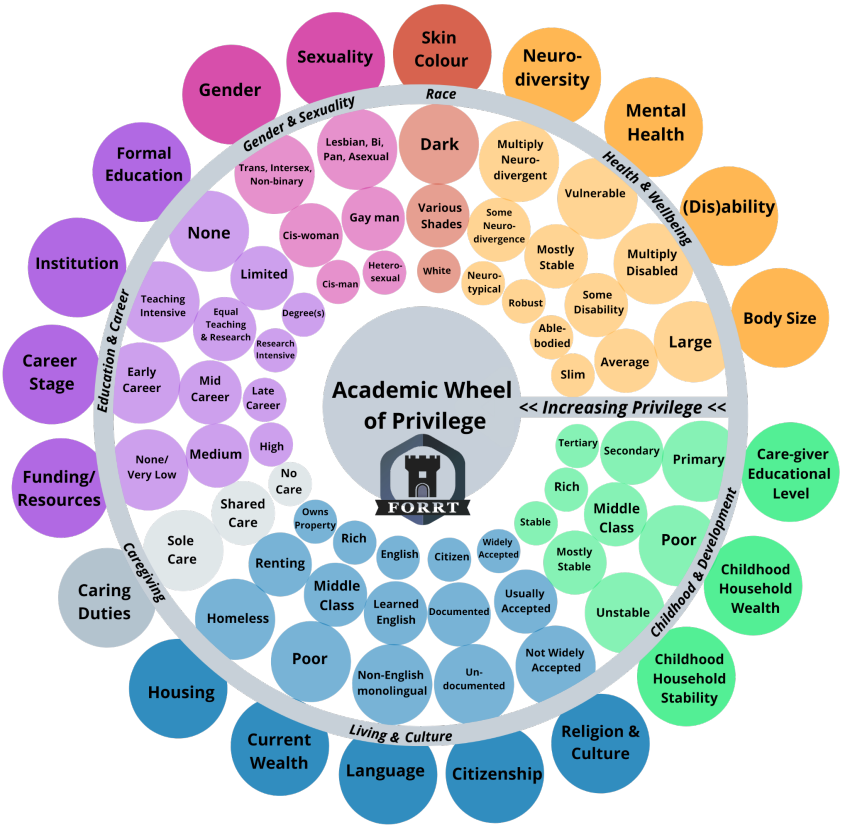

Figure 1: The Academic Wheel of Privilege developed by Elsherif et al. [17]. See also Framework for Open and Reproducible Research Training (FORRT) www.forrt.org.

We argue that these roles intensify when graduate student mentors come from historically underrepresented and marginalized backgrounds and are positioned to work with students from similar backgrounds. We also reason that utilizing the contents of this wheel allows faculty and graduate student mentors to accommodate students' needs with less judgment. By this, we suggest that the AWoP affords graduate student mentors with the opportunity to comprehensively attend to, or at the very least, give some thought to, the range of identities

that SIRI students bring with them into learning spaces.

We define graduate mentoring as efforts that guide undergraduate students in research and identity formation – that is, guiding students in an area of research while also helping them to self-actualize as researchers and scholars. This means, as one graduate student mentor described, "giving back" and providing [their mentee with] the support they wished they had when they were undergraduates. Essentially, good graduate student mentoring is “a balance of things,” giving “enough guidance” so the mentee has the information they need, but like learning to ride a bike, the mentor must also “let go of the handlebars” at some point so the mentee can learn and demonstrate their ability. It is being supportive, providing a good balance of guidance and challenge, and helping to foster the mentee’s independence.

Method

Setting. The SIRI program is currently in its fourth year. It is held at two universities - a Hispanic-serving research-intensive (R-1) university in the American Southwest and a predominantly white R-1 institution in the American Midwest. The program encourages students to pursue advanced studies in engineering and related workforce fields by engaging them in various activities. Each student is assigned a faculty supervisor and a graduate student mentor to guide them through project design. The program also provides support from higher education practitioners and workforce professionals to help students conduct a CPS-centered research project or experiment [24]. In the summer of 2024, the program will expand to include a third campus, another predominantly white R-1 university in the American Northeast. At the time of this writing, 27 students have participated in SIRI between the summers of 2021 and 2023.

Participants. Participants for this study included five doctoral students from the same institution, two women and three men, representing diverse racial and ethnic backgrounds. Two of these five directly mentored SIRI undergraduates on a research project. The other three served in a more supporting role, mainly engaging students in community-building activities. In 2023, when Reid switched universities, the leadership team was formed to ensure proper support for SIRI students. As part of the leadership team, students assisted with overseeing the program, organizing and scheduling debriefing “huddles,” [24] mapping out weekly activities, and creating community among the participants. All five graduate students helped to organize and manage the community-building activities with the SIRI students. Additionally, another student, who is now a doctoral student in an engineering program at a historically Black university in the southern United States, provided insights on her experience as a former mentee in SIRI.

Researchers. The three authors of this paper are Black women and co-principal investigators on the larger CPS project. Peele-Eady, a social scientist, served as a participant observer and researcher in SIRI, while Reid, an engineer, acted as a faculty supervisor for SIRI participants. Godwin, also an engineer, recently joined the project and will serve as a faculty supervisor in the next SIRI round in 2024. Peele-Eady's role was mainly research, data collection, and analysis. Reid worked closely with the graduate students and played an instrumental role in helping them form a Graduate Student Leadership Team. All three authors worked together to analyze the data and write this paper.

Data Collection and Analysis. Data for this study are drawn from interviews, focus groups, and

individual conversations with students about their mentoring experiences in SIRI. Using a qualitative focus group interview format, we asked the mentors to share their thoughts about mentoring and to comment on the ways the identities depicted in the AWOP could be useful in helping graduate students interact with undergraduates as mentors. We also engaged the students in a discussion of ways to improve SIRI programming and preparation of mentors and thematically analyzed the students' responses.

Findings

Findings show that students' mentoring practices fostered three interrelated abilities: *empathy, perspective-taking, and greater social sensibility*. In the next sections, we illustrate how these abilities showed up in the students' reflections on their mentoring practices. Though inextricably connected, we discuss these separately for the purpose of analysis.

Empathy. Empathy refers to the ability to understand and share the emotions of others. In SIRI, empathy showed up as times when graduate students understood both their own experiences and those of the students. As the students described them, a good mentor observes and listens to the mentee, "adapts" to the mentee's needs, and is "there" for them. Their practice embodies understanding and trust. As students reflected on the positive aspects of their mentoring practice, several commented on the need for "honesty" and "transparency," and they named caring as an essential aspect of good mentoring.

The former SIRI participant characterized good mentoring as follows:

> Someone that has good communication, open communication, a judge-free zone, where you can be open and honest, someone that can give you advice, someone [who] can just be [an] ear, I think oftentimes the best thing about [a] mentor [is that] a mentor needs to listen to listen and not listen to respond; someone that you can trust, whether that's academically, emotionally, mentally, just friendship-wise, someone that you know wants the best for you and oftentimes can see how far you can make it even if you don't see that for yourself.

At the same time, however, students understood that mentoring is a "bi-directional relationship." From this perspective, students recognized the need to think about, and in some cases, prioritize, their own needs as well. Students admitted, for example, that time management was a challenge, and they could not resolve all of their mentees' problems. "In a good way, I'm more caring. In a bad way, I'm more conservative." In short, graduate students show empathy by getting to know their mentees as people, and the AWoP is a helpful tool in facilitating this process. Consider the following:

> I think [the AWoP] is pretty helpful…it'd be fitting for orientation, for like, graduate students to look at, I previously mentioned like, having like a workshop for mentors, I know there's a training we have to do…I think it is helpful for the graduate mentors to realize where they're coming from; I think just being aware of that is enough. Whatever you have to do is dependent on two individuals, you can't expect your mentee to just be like a mini-me. I think that helps a lot. It's like having that open line of contact when people need me, what they say in planes,

> you have to put the breathing mask on first before you can help others, I try not to put myself in that position, just accepting that.

Another mentor reflected on how the AWoP inspired him to not only be introspective, but also to consider the individual journeys of his mentees:

> [it] helps you reflect on kinda those things that have shaped you to who you are; and you can reflect on the undergrad that's coming in and kinda reflect on maybe some of the things that make up who they are, granted you might not know everything, 'cause some of these [categories/identities] aren't you know, known, unless you ask 'em, but um, yeah…I think like, it's helpful to know like where people are coming from, because I think that uh, you know, that can be half the equation, I think the other half that the AWoP doesn't capture, is like where [the students] are going, and I think kinda knowing both of those… get a trajectory or learn what their aspirations or their hopes are…knowing where they're coming from and where they're trying to go, that might give a complete picture, um as you mentor, 'cause, you know, hey, how do I say things that won't you know, offend them, how do I say things that will help me relate to them, and also how do I say things that will kind of push them to where they want to get to, and how do I open them up to new possibilities as well.

Perspective-taking. The students recognized the significance of perspective-taking in their mentoring role. They understood the importance of "believing" in their mentees, providing them with constructive feedback without "micromanaging" or assuming at the outset (without knowing them) that the mentee is "struggling." The mentors emphasized the importance of being comfortable with the mentee's questions, acknowledging their limitations as mentors, and appreciating the strengths that mentees bring with them to the program. A case in point, one mentor noted,

> It [is] also about understanding their experiences, and like their backgrounds and where they're coming from, and like really integrating that into- kind of like tailoring their research journey for them, what they're looking to get out of it, what kind of impact they're looking to make, and integrating them into what it's like, in everyday life [in] graduate school.

Comparatively, mentees have to "think about" and be passionate about their own inquiry. As one international graduate student mentor explained, "Mentoring [is] about providing [mentees] with a kind of experience. It's hard to experience graduate life or research…, so mentoring is just kind of providing guidance to make them experience the very same thing that we are daily doing." Therefore, mentors can use students' passions and interests to anchor the mentoring practice.

The mentors also acknowledged that mentees sometimes seek mentors who can provide them with support or perspectives on things beyond academics. In this way, perspective-taking intersects with empathy. Consider as an illustration what the former SIRI student noted about her SIRI mentoring experience:

> She was a Black woman. We were both from Detroit, so we had that in common, and I think her just being herself was probably the best experience, like she showed me around the town, ended up getting lunch, and it had nothing to do with like, academics, it was just us vibing, just being a Black woman in a white town, in a white city, in a white country, I guess.

When she learned that her faculty mentor was a Black woman, this SIRI participant (also a Black woman) found a shared understanding with her mentor that made the program worthwhile.

She continued:

> I was really, really excited, 'cause I felt like as a Black woman, there are just some unspoken things that we already know you gotta deal with, misogyny, patriarchy, microaggressions, like even if we go to a completely different campus, we've had a completely different upbringing, I know you walked into that [Engineering 100] class, you [were] probably the only Black girl. You [were] probably the only minority and you felt like you didn't belong here because nobody else looks like you. And I feel like that was kinda the unspoken relatability we had…, it's like, I know what you've been through, you know what I went through, so, you know, [we're here] to help each other. And I think when it comes to what we spoke about, it was I think my favorite part was I had control over my project, and I didn't have to explain why it was important, I didn't have to explain why I wanted to do it, you automatically got it…. it was already understood.

In other words, for this Black student, having a Black mentor meant access to "wisdom that the other people couldn't provide [her] with."

Parallel to the former SIRI student's perspective, in her work as a faculty mentor, Reid asserted the importance of affording students the freedom to do work that is important to them. Reid concluded, "I know the power of having- being passionate - working on something that you can relate to." In sum, "mentors must be mindful [of] what is important to their mentees."

Social Sensibility. Social sensibility refers to the students' awareness of how individual differences can affect people's experiences in life and goal attainment, especially in organizations. It involves understanding different dimensions of diversity, equity, inclusion, and belonging. Consequently, it is important to develop the students' technical skills and their sensitivity towards others, especially if they are to become future faculty in our constantly changing and complex global society. Although minoritized individuals are still underrepresented in postsecondary STEM degree programs and STEM-related job areas [17], [25], graduate student mentors understand that they will likely work with mentees from diverse social, cultural, and linguistic backgrounds. Therefore, it is crucial to integrate these understandings into graduate education.

As one mentor noted,

> Even though we're mentioning papers and like poster awards and stuff like that, in

> the end, it's just humbling to realize like you're a part of someone's personal growth to some extent, so that in itself is pretty rewarding, too. So anything that just shows that progress or growth, I think is like, it's worth being proud of.

Graduate student mentors understand that their mentees' diverse experiences and concerns shape their unique mentoring needs. This knowledge informs how graduate students mentor and what they consider important to their practice. Further, mentors also noted how the AWoP was helpful to them as international students and inspired them to think about the different identities that people carry. One of these mentors expressed, "As an international student, this is very new to me, [where I'm from], people are all the same."

Discussion & Conclusion

In sum, graduate student mentors in SIRI understood mentoring as articulated by one mentor, "being a good example to [their undergraduate mentees] and helping them achieve what they want to do, and setting a good example, and helping … inspire them to do something they didn't previously think of."

A key aim of this analysis has been to illuminate the conditions that support graduate student mentoring. We argue that these conditions include opportunities to cultivate meaningful relationships. The relationships that graduate students established with their mentees were meaningful and, in several cases, lasted well after SIRI. Several graduate students indicated that they keep in contact and maintain close relationships with their SIRI mentees. Having the ability to authentically connect personally with their mentees and their experiences proved a critical part of the mentoring experience.

The AWoP exercise was helpful to the graduate student mentors in significant ways. When asked to comment on the usefulness of AWoP in their mentoring practice, several mentors found the AWoP enlightening. AWoP helped mentors negotiate mentoring identities and practice through empathy, perspective-taking, and social sensibility. In this way, the identities depicted in AWoP in their work with SIRI mentees helped mentors contribute to their repertoire of understanding to shape their mentoring practice. We argue that having an awareness of the AWoP identities influenced how the graduate student mentors approached their work with SIRI students. Even if they did not act on the identities per se, students were aware that these identities matter and were operational in their SIRI interactions. In general, the graduate students learned more about themselves from the AWoP exercise and were generally pleased with their mentoring practice when it made the mentee feel good or experienced marked growth.

Finally, additional information on the strategies graduate students employ in their mentoring practice is important to document, and we need more empirical studies of the direct interventions that promote a positive mentoring experience for both the mentor and mentee. As an engineering research context that targets participants from historically underrepresented and minoritized communities, SIRI offers a unique opportunity to explore how greater intentionality in program recruitment and ensuring diversity across all aspects of programming supports the graduate mentoring experience.

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References

[1] L. S. Behar-Horenstein, K. W. Roberts, and A. C. Dix, "Mentoring Undergraduate Researchers: An Exploratory Study of Students' and Professors' Perceptions," *Mentoring & Tutoring: Partnership in Learning*, vol. 18, no. 3, pp. 269–291, Aug. 2010. doi: 10.1080/13611267.2010.492945.

[2] M. F. Campanile, F. Doe, E. R. Jacobs, N. G. Lederman, and E. M. Brey, "From the undergraduate student perspective: The role of graduate students in an undergraduate research program," in *2013 ASEE Annual Conference & Exposition Proceedings*, Atlanta, Georgia 2013.

[3] S. E. Evans, A. R. Perry, A. Kras, E. B. Gale, and C. Campbell, "Supervising and mentoring undergraduates: A graduate student perspective," *The Behavior Therapist*, vol. 32, no. 4, pp. 77–82, 2009.

[4] B. Ahn and M. F. Cox, "Knowledge, Skills, and Attributes of Graduate Student and Postdoctoral Mentors in Undergraduate Research Settings," *J of Engineering Edu*, vol. 105, no. 4, pp. 605–629. doi: 10.1002/jee.20129.

[5] B. Ahn, M. Cox, H. Diefes-Dux, and B. Capobianco, "Examining the Skills and Methods of Graduate Student Mentors in an Undergraduate Research Setting," in *2013 ASEE Annual Conference & Exposition Proceedings*, Atlanta, Georgia, 2013. doi: 10.18260/1-2--19577.

[6] R. Reddick, K. Griffin, R. Cherwitz, A. Cérda-Pražák, and N. Bunch, "What You Get When You Give: How Graduate Students Benefit from Serving as Mentors," *The Journal of Faculty Development*, vol. 26, no. 1, pp. 37–49, Jan. 2012.

[7] J. Tsai, D. Kotys-Schwartz, B. Louie, V. Ferguson, and A. Berg, "Graduate Students Mentoring Undergraduates in Research: Attitudes and Reflections about these Experiences," in *2012 ASEE Annual Conference & Exposition Proceedings*, San Antonio, Texas, 2012. doi: 10.18260/1-2--21435.

[8] J. Y. Tsai, D. A. Kotys-Schwartz, B. Louie, V. L. Ferguson, and A. N. Berg, "Am I a Boss or a Coach? Graduate Students Mentoring Undergraduates in Research," in *2013 ASEE Annual Conference & Exposition Proceedings*, Atlanta, Georgia, 2013.

[9] P. Ann Mabrouk and M. Gapud Remijan, "Critical traits of graduate student mentors affecting students' science identity development in an NSF-funded research experiences for undergraduates (REU) program," *Mentoring & Tutoring: Partnership in Learning*, vol. 31, no. 1, pp. 103–121, Jan. 2023. doi: 10.1080/13611267.2023.2164988.

[10] M. E. Fallon, "A Graduate Student's Mentorship Pedagogy for Undergraduate Mentees," *Biomed Eng Education*, Jul. 2023. doi: 10.1007/s43683-023-00121-7.

[11] S. C. Kim, D. Oliveri, M. Riingen, B. Taylor, and L. Rankin, "Randomized controlled trial of graduate-to-undergraduate student mentoring program," *J Prof Nurs*, vol. 29, no. 6, pp.

e43-49, 2013. doi: 10.1016/j.profnurs.2013.04.003.
[12] V. Washington and J. Mondisa, "A need for engagement opportunities and personal connections: Understanding the social community outcomes of engineering undergraduates in a mentoring program," *J of Engineering Edu*, vol. 110, no. 4, pp. 902–924, Oct. 2021. doi: 10.1002/jee.20422.
[13] E. Marquez and S. Garcia, "Quality Mentorship Matters: An Innovative Approach to Supporting Student Success in Engineering Undergraduate Research," presented at the 2021 ASEE Virtual Annual Conference Content Access, Jul. 2021.
[14] E. Dolan and D. Johnson, "Toward a Holistic View of Undergraduate Research Experiences: An Exploratory Study of Impact on Graduate/Postdoctoral Mentors," *J Sci Educ Technol*, vol. 18, no. 6, pp. 487–500, Dec. 2009. doi: 10.1007/s10956-009-9165-3.
[15] D. D. Anderson and W. J. Shore, "Ethical Issues and Concerns Associated With Mentoring Undergraduate Students," *Ethics & Behavior*, vol. 18, no. 1, pp. 1–25, Mar. 2008. doi: 10.1080/10508420701519577.
[16] S. Middleton, B. Iley, J. Sulik, M. E. Elsherif, and F. Azevedo, "The Academic Wheel of Privilege: An equity-based tool for authorship order." Framework for Open and Reproducible Research Training. [Online]. Available: https://forrt.org/publications/
[17] M. M. Elsherif *et al.*, "Bridging Neurodiversity and Open Scholarship: How Shared Values Can Guide Best Practices for Research Integrity, Social Justice, and Principled Education," MetaArXiv, preprint, Jun. 2022. doi: 10.31222/osf.io/k7a9p.
[18] G. Ladson-Billings, *Culturally relevant pedagogy: Asking a different question*. Teachers College Press, 2021.
[19] G. Gay, "Culturally responsive teaching principles, practices, and effects," in *Handbook of urban education*, Routledge, 2013, pp. 391–410.
[20] K. W. Crenshaw, "Race, reform, and retrenchment: Transformation and legitimation in antidiscrimination law," in *Law and social movements*, Routledge, 2017, pp. 475–531.
[21] D. W. Derbyshire *et al.*, "Keywords are missing: Insights from the publication keywords, abstracts and titles of an environment and human health research group," *Equity in Education & Society*, vol. 2, no. 3, pp. 303–316, Nov. 2023. doi: 10.1177/27526461231163326.
[22] L. C. Beruin, "Learning privilege divide: A framework for interrogating personal privileges of STEM students education during the pandemic," *Journal of Pedagogical Sociology & Psychology*, p. 4, Nov. 2023. doi: 10.33902/JPSP.202323515.
[23] P. Mehta and C. D. Buckley, "'Your people have always been servants': internalised racism in academic medicine," *The Lancet*, vol. 400, no. 10368, pp. 2045–2046, Dec. 2022. doi: 10.1016/S0140-6736(22)02486-2.
[24] T. Peele-Eady, and T. Reid, "What Difference Does Difference Make? A Case Study of Racial and Ethnic Diversity in a Summer Intensive Research Institute," in *2023 ASEE Annual Conference & Exposition Proceedings*, Baltimore, Maryland: ASEE Conferences, Jun. 2023. doi: 10.18260/1-2--44610.
[25] K. Kricorian, M. Seu, D. Lopez, E. Ureta, and O. Equils, "Factors influencing participation of underrepresented students in STEM fields: matched mentors and mindsets," *International Journal of STEM Education*, vol. 7, no. 1, p. 16, Apr. 2020. doi: 10.1186/s40594-020-00219-2.