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RESEARCH ARTICLE

"The lab isn't life": Black engineering graduate students reprioritize values at the intersection of two pandemics

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Abstract

Background: Black engineering graduate students represent a critical and understudied population in engineering education. Gaining an understanding of the lived experiences of Black engineering graduate students while they are simultaneously weathering two pandemics, COVID-19 and systemic racism, is of paramount importance.

Purpose/Hypothesis: Black engineering graduate students hold a unique duality, as both Black people in the United States and Black graduate students in US engineering programs that espouse white supremacist ideals. Their real-world experiences necessitate understanding, and this paper highlights the related impact on the students themselves, their adaptations to the pandemics, and how those adaptations relate to and affect their support needs and navigation of their engineering academic environments.

Design/Method: An interpretive phenomenological analysis (IPA) approach was combined with community-based participatory action research and was situated in Boykin's Triple Quandary. A family check-in was conducted with 10 Black engineering graduate students enrolled in doctoral programs across the country to delve deep into their lived experience as a cultural community.

Results: Findings include an emergent framework of Black engineering graduate student values in response to the pandemics. These values aligned with the Black Cultural Ethos, demonstrating an adoption of collectivistic cultural values in times of crises. Further, COVID-19 and systemic racism differentially impacted Black engineering graduate students and, thus, the manifestations of their values.

Conclusion: For institutions to be able to effectively support their Black engineering graduate students, they must gain awareness of the students' experiences, values, and needs, in general, and amid crises specifically. The findings presented here provide a critical window into this information.

KEYWORDS

Black cultural ethos, Black engineering graduate students, COVID-19, pandemics, systemic racism

1 | INTRODUCTION

> *The rawness of this moment is real. Racism is alive and well in our society and also within academic institutions inclusive of engineering programs. Their story described it in detail. Black engineering students just told us explicitly they are leaving academia for an opportunity for their identity to become visible and or if not where "... there are 'at least some benefits' [in reference to higher compensation and perks in industry] that come with their pain." We just walked through our armor of pain that we never get to take off, across levels, across regions, across schools, across engineering disciplines—and still—a strongly shared experience. In this gathered community, it served to be a learning space for us as researchers, a counterspace for the community members and a healing space for all. We engaged for over two hours, and no one seemed hurried to go. As a note of the methodology, this research approach as community participatory action was truly executed. The students took agency in leveraging the space we created for research into action that cultivated its transformation into a space of healing that they all needed. Most striking for me was their gratitude for us wanting to know their lived experience. I believe there is already an obvious implication in that.*
>
> Coley Post-Family Check-In Reflection Memo excerpt, July 2020

This is an excerpt from the first author's reflective memo following a check-in conversation with Black engineering graduate students during two simultaneous pandemics: COVID-19 and systemic racism. We frame systemic racism as a pandemic to acknowledge both the acute circumstances around society's racial reckoning in 2020 and to situate that moment within a centuries-long history of systemic racism.

In 2018, Black students made up less than 2% of the doctoral student population in engineering across all disciplines, despite making up 13% of the US population (American Society for Engineering Education [ASEE], 2020). Of the 203 institutions reporting to ASEE, 53.7% had no Black students receive doctoral degrees that year compared to only 12.8% awarding doctoral degrees to three or more Black students (ASEE, 2020; Main et al., 2020). Beyond what the numbers tell us, a growing body of research demonstrates the racialized climate of higher education, where students of color, and especially women at the intersection of race and gender, experience microaggressions, racism, tokenism, sexism, and more, in navigating white male-dominated environments (Brown et al., 2016; Ong et al., 2011, 2018; Wilkins-Yel et al., 2022).

In the spring of 2020, many institutions spontaneously transitioned to virtual learning in response to the imminent threat of COVID-19. With little to no preparation, faculty and students moved to a learning platform that eliminated in-person interaction. While everyone was impacted by this COVID-19 pandemic, Black people were impacted disproportionately. Specifically, they have been 2.1 times more likely to die because of the virus (National Center for Health Statistics, 2020). We use the term Black people in the remainder of this publication not just to refer to Black as a race in the context of the United States, but also as a community through a lens of cultural and social construction. On May 27, 2020, while discussing the deaths of George Floyd and Ahmaud Arbery, CNN Anchor Don Lemon announced "there are two major crises in this country tonight. Two deadly viruses killing Americans. COVID-19, and systemic Racism" (Voytko, 2020). The threat of COVID-19 and systemic racism posed a serious threat to Black people where health, physical and emotional safety were simultaneously at risk.

In the fall of 2018, we began a study with Black engineering graduate students focused on how their engagement in professional organizations, primarily the National Society of Black Engineers and Black Greek Letter Organizations, had impacted their successful navigation of engineering at the undergraduate level. We interviewed over 30 Black engineering graduate students and gained many insights (K. Thomas et al., 2021), two of which are particularly salient to the study presented here. First, the identity of being Black in engineering comes with a unique set of challenges that exacerbates the strain experienced by Black engineering graduate students. Second, counterspaces serve as an effective haven to counteract the marginalizing experiences of Black Engineering Graduate Students, fostering a sense of belonging and community in an affirming, edifying environment. COVID-19 mandated physical isolation. Systemic racism triggered the acknowledgment of endured racial injustice. The confluence of these experiences has and continues to impose unprecedented distress on the lives of Black engineering graduate students—this phenomenon requires greater understanding.

The purpose of this study was to gain insight into the lived experiences of Black engineering graduate students who were uniquely experiencing two simultaneous pandemics while also pursuing their doctoral degrees. Our work was guided by the following research questions: (1) What have been the lived experiences of Black engineering graduate

students navigating the intersection of two pandemics (COVID-19) and systemic racism? (2) How do Black engineering graduate students adapt in order to simultaneously navigate two pandemics? (3) How have each of the pandemics differentially impacted Black engineering graduate students, if at all?

2 | REALITIES FOR BLACK ENGINEERING GRADUATE STUDENTS

As a result of the racialized climate and marginalization Black students endure during graduate school, Black engineering graduate students are often forced to adopt coping strategies, such as stereotype management, to successfully navigate their academic environments (McGee, 2018; Wilkins-Yel et al., 2022). To counteract the impact of deficit-oriented, dominant cultural narratives and representations, Black engineering graduate students strongly rely on counterspaces, or communities of psychosocial and professional support (Burt et al., 2018; Hunter et al., 2019; McGee et al., 2019; Ong et al., 2018; K. Thomas et al., 2021). Counterspaces provide a space for Black engineering graduate students to connect with others who share and/or prioritize their racial identity (Case & Hunter, 2012; Main et al., 2020; Ong et al., 2018; K. Thomas et al., 2021). Access to such a critical community can foster a sense of belonging—and through experiences of affirmed identity—positively impact persistence in engineering (K. Thomas et al., 2021).

For Black engineering graduate students, navigating simultaneous pandemics created a corresponding duality of isolation. Several studies have highlighted the isolating experiences that Black students encounter as a manifestation of the white supremacist ideals that undergird these institutions (Burt et al., 2019; Hunter et al., 2019; Main et al., 2020; McGee & Stovall, 2015; McGee & Bentley, 2017; McGee et al., 2019; Ong et al., 2018; Wilkins-Yel et al., 2022). As a predominantly white field, Black engineering students are often the only Black representation in their educational and professional spaces. These isolating experiences are often associated with racially charged experiences of microaggressions and bias. An example of this is the pet-to-threat phenomenon, where People of Color are welcomed into a space (pet) but are perceived as a threat when they start to challenge the status quo (K. M. Thomas et al., 2013). McGee et al. (2019) described this phenomenon for Black doctoral students in engineering, where they may be welcomed into their doctoral programs, but are not treated equally to their peers once they are there. Then, as they begin to achieve academic success, they are seen as a threat and therefore encounter more instances of microaggressions and resistance.

In navigating these harmful and stressful environments, Black students found safety and solace in social networks like counterspaces (Case & Hunter, 2012; Ong et al., 2018; K. Thomas et al., 2021). However, COVID-19 altered the ways in which Black students were able to connect with one another. Counterspaces previously located on campuses and in public spaces became unavailable or limited to virtual availability, limiting spontaneous interactions and informal access to their associated supports and increasing isolation. The abrupt removal of the critical support provided by these counterspaces only aggravated the effect of the systemic racism pandemic on Black Engineering students.

3 | GROUNDING AN ETHOS

To inform our methodological approach, we center the constructs of kinship and solidarity (Gay & Baber, 1987). The concept of kinship and solidarity is essential in framing this work as it speaks to the historical unity of Black people relative to racial pride, group identity, and cultural consciousness (Folb, 1980). These efforts date back to the resurgence of the Black cultural consciousness movement in the 1960s, where Blacks collectively addressed racism in the context of American society, advocating solidarity for social change (Gay & Baber, 1987). Often captured in expressions of kinship, the words "family" and "member" are strategically used in this work reminiscent of camaraderie and shared destiny (Gay & Baber, 1987). Here, we apply this concept of family and members in recognition of the shared experience of Black engineering graduate students in general, and specifically as influenced by the dual pandemics.

We wish to advance the ideals of Black intellectualism in engineering education. As such, in alignment with our commitment to the integrity of modeling antiracist research practices, we prioritize our commitment to our community members. These choices elongated our timeline, reduced our own productivity, and required us to create additional justification for our approaches to our broader engineering education research community. We anchor our work in the spirit of "rigorous researchers ... [who] push themselves beyond convenience, opportunism, and the easy way out" (Tracy, 2010, p. 841).

4 | THEORETICAL AND CONCEPTUAL FRAMEWORKS

The ways of knowing and doing in engineering continue to operate from a Eurocentric worldview and set of values (Alexander & Hermann, 2016). Such approaches fail to delineate or honor the processes of socialization unique to minoritized populations. To challenge anti-Black research approaches, we aim to center Blackness across all aspects of this work. We ground the study in Black epistemology anchored in Afrocentric worldviews, which enable a centering of Black norms, beliefs, and values. Thus, we frame this study in Boykin's Triple Quandary Theory.

Boykin's Triple Quandary Theory confronts the dilemma of being Black and gifted in the United States as an ever-present negotiation of oppression and hegemony. Three psychological realms of lived experience as negotiated by Black people are described by the theory: mainstream, minority, and African-rooted Black culture (Boykin, 1986). The mainstream realm refers to an orientation of the United States to prioritize a European ethos (e.g., individualism and competition). The minority realm involves the sociopolitical injustices encountered as a racial minority in the United States (e.g., racism and prejudice). Lastly, the African-rooted Black cultural realm centers around the themes and values influenced by an African worldview (e.g., communalism). To further classify the African-rooted Black cultural realm, Boykin defined the following nine dimensions as the Black Cultural Ethos (Boykin, 1986; Parsons, 2008): spirituality, harmony, movement, verve, affect, expressive individualism, communalism, orality, and social perspective of time (Boykin, 1986; Parsons, 2008).

Past studies have shown that Black students perform better in academic settings where cultural values align with the African-rooted Black cultural realm (Johnson & Carter, 2020; Parsons, 2008). For the purposes of this work, we equate Boykin's mainstream realm to students' experiences in their academic institutions (e.g., the experience of being a Black graduate student at a traditionally white institution [TWIs]). We represent the minority realm by their experiences in society (e.g., with the awareness that Black people, as a minoritized population, have been disproportionately impacted by COVID-19 and police brutality), and we represent the African-rooted Black cultural realm with their identity-affirming experiences (e.g., the shared kinship and solidarity of the community formed in the research study).

We recognize the individuality of Black people and know that Blackness is not a monolith; we choose to situate the commonalities of the students' shared experiences as Black graduate students in engineering amidst a critical moment in society and consider them a cultural community. We employed Black Cultural Ethos as a means of understanding their related experiences. Additionally, to better represent the negotiation that Black graduate students experience in the mainstream realm, we include Schwartz's Value Theory, which is a cross-culturally validated representation of personal values (Schwartz, 2012).

The combination of these framings provides a holistic representation of the values of Black engineering graduate students. While other studies situated in engineering have related values to engineering or a specific task (Jones et al., 2010; Mosyjowski et al., 2017), we chose to focus broadly on personal, basic human values. This allows us both to more fully engage with the authentic experiences of the members (what we call participants in this study, see Section 5) during the pandemics and to relate those experiences to their navigation of their academic cultures within their institutions.

Finally, we applied the stem cell fate decision model as a conceptual framework to understand how the values of Black engineering graduate students may have shifted and/or been reprioritized in response to the dual pandemics. The stem cell fate decision model represents the decisions stem cells make in response to external factors and stimuli (i.e., fate decisions). Stem cells can be pluripotent, meaning they possess the ability to give rise to several different cell types, and they can adopt diverse behaviors as they proliferate and grow (Harding & White, 2018). In their decision making, stem cells can take on different forms, assume a new identity, and/or assume one of four different states: affirmed, challenged, removed, and developed.

We see a natural parallel between stem cells and graduate students, and we apply this conceptual lens as a metaphoric taxonomy for how Black engineering graduate students navigate fate decisions related to their own values in response to the external stimuli of the two, simultaneous pandemics. Through the application of this conceptual lens to the members' stories and experiences, we ascertain how their values were affirmed, challenged, removed, or developed in response to the pandemics.

5 | METHODS

5.1 | Evolving and merged methodologies of interpretive phenomenological analysis and community-based participatory action research

The lived experiences of Black engineering graduate students simultaneously navigating a global (COVID-19) and a national (systemic racism) pandemic warranted the adoption of an interpretive phenomenological analysis (IPA)

approach. O'Reilly & Kiyimba, (2015) described phenomenology as "a way of thinking that emphasizes the need for researchers to achieve an understanding of their participants' worlds from the participants' point of view and the ways in which those participants make sense of the world around them" (p. 14). In an IPA study, researchers describe the whole phenomenon in the subsections and focus their analytical gaze on participants' lived experiences with the goal of developing the meaning of the lived experience via extensive analysis of each participant (Huff et al., 2021). IPA has been applied in engineering education research to examine students' professional experience and identity development (Huff et al., 2021). Given the highly individualized yet collective nature of how Black graduate students in engineering uniquely experienced the onset of two pandemics, IPA was a methodological framework that supported our answering of the study's research questions.

As we engaged with the group and the project evolved, we captured our community members' meaning-making processes while also exploring the continuation of their experiences collectively. As the work became more centered on the co-construction of shared experiences, our methodologies evolved to combine community-based participatory research with the characteristics of IPA. The framework by Bush et al. (2019) validated our approach as community-based participatory research in that: the concerns of a specific community were being addressed in examining the lived experience at the intersection of the pandemics; the understanding of this phenomenon was being co-created with the participants; and finally, the knowledge gained from the research was strategically targeted to inform change for the group under study. As a result, we do not claim to use IPA rigidly, but broadly to interpret lived experiences of our community members. We simultaneously leverage community-based participatory action research (CBPAR) to embrace the community perspective over the sense-making of the psychological experience alone. In our work, we established a community and have done everything in our power to conduct the research in ways that centered meaning and action (Figure 1).

5.2 | Focus group and phenomenology

Lastly, we recognize the importance of justifying our use of a focus group given our phenomenological approach. Focus groups have been criticized in the past for their failure to capture the essence of individual experiences (Blake et al., 2007) and their tendency to form a collective voice that dominates individual stories (Tomkins & Eatough, 2010). However, in recent years, researchers have embraced and encouraged the use of focus group conversations in conducting IPAs (Flowers et al., 2001; Love et al., 2020).

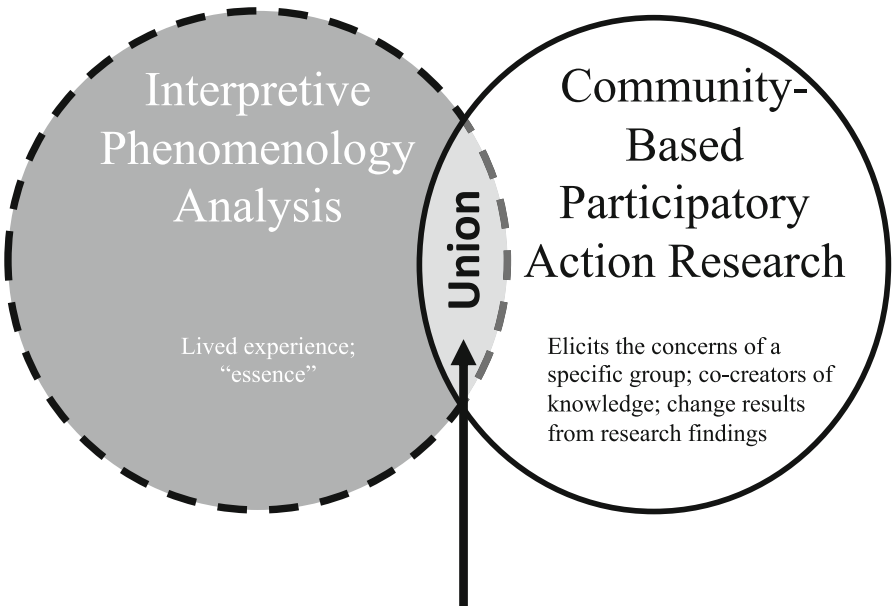

FIGURE 1 Demonstrated benefits of uniting interpretive phenomenology and community-based participatory research approaches.

We argue that focus groups actually enhance the IPA approach in three distinct ways: (1) Conducting a focus group with several participants enabled each participant to share their own experiences while leveraging the experiences of other focus group members; this group interaction served to stimulate and encourage ideas that some community members may have felt less inclined to share independently (Flowers et al., 2001; Palmer et al., 2010); (2) We encouraged community members to share both convergence and divergence in their experiences (Love et al., 2020); and (3) We viewed participants as community members. We ensured the unit of analysis remained at the individual level as represented through individual excerpts and language while focusing on the phenomena of experiencing the dual pandemics as a Black engineering graduate student (Tomkins & Eatough, 2010). Focus groups, as a tool to enhance personal accounts, provided us with the best understanding of the given phenomenon and a robust way of representing the participants' collective experience and voice (Love et al., 2020).

5.3 | Data collection

In alignment with the purpose and methodological framing of this work—holding a virtual focus group serving as a space of community, action, and research—it was important for us to recognize the participants as a community (Bush et al., 2019). This work emerged out of a larger study with a group of Black engineering graduate students that began circa 2018. Pre-pandemics, we initiated the establishment of rapport with many of the members. For many of them, the focus group was one of several contact points with our research team, as individual interviews had previously been conducted to situate their graduate school experiences. We began to operationalize this group of participants as a community of Black engineering graduate students, and subsequently, refer to them each as community members, or *members*.

We announced the focus group as a *Family Check-In* in reaching out and spreading the word about the creation of an intentional virtual space where members of that community could attend, share, vent, be heard, and come to understand the essence of their lived experiences in navigating the pandemics. We were intentional in informing students that the conversation held would dually serve as research. Specifically, the transcript of the *Family Check-In* would serve as primary data for us to empirically understand their experiences with the immediate goal of sharing this critical information with institutions and administrators. We intentionally used the phrase, *Family Check-In*, rather than "focus group" to maintain the integrity of the space and community, grounded in kinship and solidarity. We recruited members from the National Professional Organizations' role in Supporting Black Engineering student success (PROSE) Study. Specifically, we contacted a group of students, consisting of 15 members, and invited them to participate in the *Family Check-In*. At that time, all cohort members had been scheduled to meet in person at the National Society of Black Engineers (NSBE) Annual Convention in March 2020 for a community-building activity associated with the larger project. However, due to COVID-19, the convention was canceled and rescheduled for a virtual conference later that summer. As a result, students lost what would have been their opportunity to meet in person as a cohort. Because members saw the value in the *Family Check-In*, cohort members inquired as to whether the invitation to participate could be extended to non-cohort members.

The *Family Check-In* included 10 Black graduate students in engineering (5 women and 5 men; 5 being members of the PROSE Cohort and seven having been recruited via snowball sampling). The conversation was held virtually via Zoom due to the physical restrictions and isolation of the COVID-19 pandemic for 2.5 h one evening in July 2020. The timing of this meeting coincided with growing surges in the COVID-19 pandemic and a national hyperfocus on systemic racism prompted by the ruthless murder of George Floyd. Inclusion criteria for the *Family Check-In* required students: (1) to identify as Black (inclusive of domestic and international/immigrant status) and (2) be a graduate student currently enrolled in an engineering PhD program at an accredited institution in the United States. While members represented a non-monolithic set of identities at the intersections of Blackness, in alignment with our research methodology, we focused our data collection and analysis on only Black identity. Consideration of the experiences at the intersections of Blackness and other minoritized identities is being considered in our continuing work.

Participants were compensated with a $100 Amazon gift card for their participation immediately following the *Family Check-In*. Community member demographics are presented in Table 1 where member and institution names have been pseudonymized. Though the institutional profiles associated with the members varied in size, control, and region, all the institutions represented by members in the *Family Check-In* were TWIs.

In designing our semi-structured protocol, situated in the principles of IPA, we tried to engage the psychological and social worlds of our members. We viewed the Black engineering graduate students as experiential experts, and therefore, fully supported them in telling their stories (Smith & Osborn, 2007).

TABLE 1 Community member demographics.

Member pseudonym	Gender	Year in PhD	Engineering discipline	Institution pseudonym
Celia	Woman	2nd	Biomedical	Colonial Hope University
Robert	Man	2nd	Mechanical	New England Liberty University
Calvin	Man	2nd	Computer science	Chesapeake University
Amanda	Woman	2nd	Biomedical	Western Palm University
Andre	Man	2nd	Computer science	Central Peony University
Brian	Man	4th	Chemical	Central Grace University
Marvin	Man	4th	Biomedical	Atlantic Bell University
Oliveea	Woman	4th	Chemical	Golden West University
Sylvia	Woman	5th	Chemical	Central Lake University
Carole	Woman	5th	Computational modeling and simulation	Iron Hills University

Three prompts were used in the protocol: a reflective prompt at the beginning to provide the opportunity for everyone to comment on the impacts of COVID-19; an expansion prompt to provide the opportunity for everyone to comment on systemic racism; and a forward-thinking prompt to encourage the group to envision and describe post-pandemics living. The reflective prompt situated the context of the moment in terms of the disruption we were all experiencing (i.e., working and studying, virtually, as impacted by COVID-19) as a transparent reflection of the significance of that moment. Our approach was to connect through humility and an admission of the significance and impact of the moment for all as a means of opening the conversation. Following the reflective prompt, members shared their thoughts and the course of the conversation flowed. The expansion prompt was navigated with the same transparency as the opening that situated COVID-19. However, there was a significant difference in the receptivity of the members to the prompts. In transitioning to the conversation focused on systemic racism, the members immediately recognized that the major difference between these two pandemics was that only COVID-19 was recognized by everyone and every institution across the academic communities.

5.4 | Data analysis

The research team on this work consisted of the two authors. Each person on the research team read the *Family Check-In* conversation transcript several times. We first set out to identify anything deemed important to the participants in alignment with IPA practices and as recommended by Palmer et al. (2010). As this work was phenomenological in nature, it was important to ascertain the essence of the lived experience for Black engineering graduate students at the intersection of two pandemics. We did this by adopting group analysis approaches that preserved the members' voices while enabling the research team to see the areas of convergence among the community members with respect to their lived experiences (Love et al., 2020).

Once immersed in the data, we went through the transcript to identify the significant experiences and relationships related to COVID-19 and systemic racism through the stories and language shared by the members (Love et al., 2020; Palmer et al., 2010). Stories shared in the group were highly complementary while different language was often used to convey similar sentiments. We then set to establish emerging themes grounded in guiding questions of Palmer et al. including "what experiences were being shared" and "how were they making them meaningful to one another?" Identifying the emerging themes was effective in enabling us to make smaller meaning units of the data. In identifying members' supporting quotes and themes, we identified 84 in vivo codes. We identified the in vivo codes directly from participants' words (and associated timestamps) as points of entry to revisit the conversation transcript for greater context and to pick up nuances in jargon, repetition, and phrases across the members. This also positioned each of us to identify which pandemic was associated with each in vivo code. We applied abstraction to code similar themes together (Love et al., 2020; Palmer et al., 2010), which resulted in values being a major theme in the data. In assessing the individuals in relation to the overall emerging themes of the group (Tomkins & Eatough, 2010), it became clear that a part of the essence of navigating the intersection of two pandemics was a focus on values. Thus, we narrowed in on the 47 values-related codes identified.

The list of 47 codes was then reduced, grouping all codes with similar meanings such as *have not had a place to go to* and *the physical meeting makes NSBE*, *NSBE* to ultimately be conveyed as an *accessible community*. The process was executed to arrive at a list of 13 different and/or related values-manifestations identified through the stories of the community members. These values manifestations were then grouped into five values, the Black Engineering Graduate Student Pandemic Times Value Framework, and mapped to the Black Cultural Ethos. Additionally, as an added level of analysis to observe how Black values compare with mainstream values, we also mapped members' values to Schwartz's Basic Values (Schwartz, 2012). Table 2 is discussed in the findings section and provides these mappings.

In and through the discourse of the *Family Check-In*, members became aware of what was perhaps unbeknownst and/or only implicitly acknowledged values before the pandemics. Their descriptions often spoke in terms of a delta, or shift—indicative of how the experience of the pandemics, here, the external stimuli—had impacted and/or redefined their values from what they were pre-pandemics. Based on the context surrounding the values-related codes, our team also classified members' values into one of the four stem cell fate decision model outcomes. Thus, each of the five values was categorized as having been affirmed, challenged, removed, or developed.

In the stem cell decision-making model, stem cells have the ability to take on different forms, assume a new identity, and/or assume different states. We framed the interpretation of our analysis using the stem cell decision fate model, which involved four different decisions. Stem cells could either be: (1) *affirmed* by adding new dimensions or functions (terminal division); (2) *challenged* to stay as is and remain in a somewhat steady state (though here requiring effort to do so) (quiescence); (3) *removed* to dissolution (apoptosis); or (4) *developed* into or as something new (self-renewal) as highlighted by Harding and White (2018). We refer to these changes in the stem cell fate, here presented by value, as value shifts. This secondary level of analysis enabled us to have a nuanced meaning of how values and their ethos'—the manifestations of the values—were shifted to support students' prioritization of health, safety, and success amid times of crises.

TABLE 2 Black engineering graduate student values mapped to Black cultural ethos, Schwartz's basic values categories, value fate decision, and the pandemic of influence.

Black engineering graduate student values in pandemic times	Value manifestations	Black cultural ethos	Schwartz's basic values category	Pandemic influence	Value fate decision
Provenness or demonstrated ability	Maintaining productivity	N/A	Achievement	Both COVID and racism	Removed
	Predictability of executing a plan			COVID	
	Maintaining the integrity of responsibilities			Both COVID and racism	
Family and community	Family and its importance	Communalism	Benevolence	Both COVID and racism	Affirmed
	Accessible community		Security		
	Engaging with a shared identity		Tradition		
Resistance	Self-worth	Affect	N/A	Both COVID and racism	Developed
	Self-compassion				
Well-being	Self-care	Harmony	Security	Both COVID and racism	Affirmed
	Life is greater than work	Verve	N/A	COVID	
	Flexibility and adaptability				
Freedom	Navigating as an individual rather than as a representative	Expressive Individualism	Self-direction	Racism	Affirmed
	Clarity around purpose			Both COVID and racism	

Trustworthiness in our data was promoted during data collection via strong rapport with our members. During the *Family Check-In*, we co-created a space with them that embodied research, action, and healing. The instantaneous connection among members highlighted the kinship and solidarity in the group, and the sharing in the space was authentic because members wanted their collective story to be known. Our primary commitment was to honor the truth of their experience while allowing ourselves to remain open and flexible instruments. Two levels of member checking were employed, real-time and post (O'Reilly & Kiyimba, 2015). At one level, researchers sought clarity in the interview process in real-time as an effective technique to obtain quality research. At the other level, after the *Family Check-In*, informal conversations were held with members for feedback and reflection. Based on our adoption of IPA, we did not attempt to bracket our experiences. Rather, we allowed ourselves to be situated in context to the realities of the world, holding both insider and outsider status with our members. We promoted validity in the interpretation through the intentional inclusion of demonstrative excerpts of the values and their manifestations in our findings.

6 | POSITIONALITY

This work is situated as a critical, constructivist paradigm (Patterson & Williams, 1998). The authors work to demonstrate a comprehensive example of culturally responsive research and approach that center on Black engineering education research. In contextualizing our positionality, we considered several dimensions (Secules et al., 2021), beginning with the impetus for the work. The uniqueness of our situation was the duality of experiencing these societal events while actively serving in our professional roles that included faculty, teacher, student, mentor, advisor, civic/professional/student organization leader, and researcher in a field where white supremacy has long maintained the status quo. While everyone in our academic environments was experiencing the effects of COVID-19, we found little awareness of our reality as Black academics simultaneously experiencing two pandemics. In many academic spaces, only one pandemic was being acknowledged—COVID-19—and no intentional space had been created for us, as Black people, to share and discuss our experiences of the moment.

As a Black faculty in engineering, the constant negotiations of hypervisibility and invisibility in engineering environments had been taxing for the first author. I, the Lead Author, was not separate from the phenomenon I wished to explore in Black engineering graduate students; rather, I was simultaneously experiencing it from another role within the system maintaining an insider (because of race)—outsider (because of power/role) duality. The institutional tendency to recognize and prioritize imminent physical harm as presented by COVID-19, but not endured mental harm as impacted by systemic racism, registered for me as acts of institutional negligence, at best, as well as explicit manifestations of anti-Blackness in academia.

Holding more power as a faculty member than graduate students, and awareness of my own experiences as a faculty member, made me curious about how Black graduate students were navigating this pandemic intersection. We recognized the critical impact this moment was having on each of our own lives, including the norms, behaviors, and values it was forcing us to confront. We hypothesized that this time could potentially be a critical incident in the lives of Black graduate students in engineering, and one with far-reaching consequences, such as attitudes toward engineering and/or career plans. Anchored in the solidarity of the identity we all shared, we needed to reach out to the Black engineering graduate students with whom we had established rapport pre-pandemics. We had a sense of responsibility to simply check in with them and to create an intentional space for their voices to be shared and heard, freely and unfiltered. No code-switching was required nor was there a need for proving or validation of their experiences as real and/or true. We wanted to provide an opportunity for them to acknowledge their experiences, influenced by the fact that our own experience felt invisible to, if not ignored by, our greater academic community.

As a research team, we held both insider (because of race) and outsider (because of power/role or having a Black advisor, which most community members did not) perspectives with community members. The cultural knowledge we possessed was important in increasing the likelihood of them sharing perspectives that addressed the questions we were exploring (Razon & Ross, 2012; Tillman, 2002). Situated in CBPAR, the graduate student co-leading this project, the Second Author, and I were each present at the *Family Check-In* and chose to allow me as the faculty member to lead the protocol. The Second Author engaged in the *Family Check-In* as both researcher and community member and was requested to also share by the community members. It made apparent an innate kinship strongly rooted in shared Black identity. The Second Author's sharing was limited, and her involvement did not impact the contribution of community members as the questions were open and individuals were sharing their own experiences in a conversational

way. However, the authors' engagement did serve to further humanize the work, convey a shared priority of importance, and foster continued, strong researcher-member rapport.

Through memoing and reflective meetings, we aimed to honor and prioritize the voices and stories of the community members with our own shared experiences. This contributed to our ability to co-construct and make meaning of the lifeworld. From the onset, we ensured that the outcomes of the work would not die in scholarly publication but be leveraged to advance the societal and/or institutional agendas to best support Black graduate students in engineering. Many of the community members expressed appreciation for our intentionality in learning about their experiences; that we sought to partner with them in improving the state of experiences of Black students in engineering was a bonus. This work provides a frame through which our research team can contribute to and push the discipline's developing racial equity agenda with specific foci on anti-Black racism and disrupting the perpetuation of racist ideals in engineering academic spaces.

7 | LIMITATIONS

There are a few limitations to this study worth further consideration. Members' values were those that emerged through their stories rather than those identified through a direct self-report or assessment of values. It is possible that the values we identified underrepresent members' values, overall. However, we believe the values that emerged through analysis are comprehensively significant and relevant to the time point in consideration. Additionally, all the members happened to be Black students attending TWIs that were all top-ranked research institutions. Student representation from varying types of institutions (Minority Serving Institutions [MSIs] including Historically Black Colleges and Universities [HBCUs]) may have resulted in a greater array of values impacted by the dual pandemics. Specifically, no students from MSIs engaged in this *Family Check-In*. We recognize that the culture of the institution is likely to impact what individuals value and the extent to which their identity is affirmed in engineering. Therefore, we see the lack of participation of students from different institutional contexts in their experience of the pandemics to be a limitation of the study. We also posit that the participation demographics could be an implication of the urgency and need for such spaces of support for students at TWIs.

The current work also prioritized the shared identities of being Black and an engineering graduate student. Other aspects of identity such as gender, class, international/immigrant status, and membership in Black Greek Letter Organizations influenced how students experienced the pandemics. However, these aspects were not explicitly disaggregated and addressed in this study as the scope of this study was to understand the phenomenon of being a Black graduate student in engineering navigating dual pandemics. Thus, the focal identities of interest were racial and disciplinary. We were confident in this approach as members clearly expressed racial identity as being the most salient during this time. Even in the case of our international/immigrant members who primarily identified with their ethnic identity (e.g., Eritrean), Blackness became the identity guiding their interactions in their academic environments independent of their own ascriptions. The nuanced experiences of varying identities at the intersection of Blackness will be explored in the work forthcoming.

8 | FINDINGS

The purpose of the *Family Check-In* was to ascertain the essence of the Black engineering graduate students' lived experiences in navigating the intersection of two pandemics. We specifically sought to understand the emergence of values that were at the core of their navigation amidst crises. In our phenomenological approach, five values relating to both personal and professional ideals emerged as being critical to how students experienced and made sense of the pandemics. We refer collectively to these as the *Black engineering graduate student pandemic times values framework* (*Black engineering graduate student-PTVF*). The values within the framework, differentially impacted by the two pandemics, ranged from those that were salient and present daily to those that remained dormant until triggered by context. Table 2 describes several aspects of the Black engineering graduate student-PTVF. Specifically, it indicates: (1) the manifestations of each of the values; (2) the pandemic(s) of influence—COVID-19 (C), systemic racism (R), or both (B); (3) the mapping of the values to their appropriate stem cell fate decision (i.e., affirmed, challenged, developed, removed); (4) the mapping of each value to Black Cultural Ethos; and (5) the mapping of the values to Schwartz Values.

Our findings section will focus on the values within Table 2 that are simultaneously aligned with Black Cultural Ethos and that take on one of the following three stem cell fate decisions: affirmed, removed, or developed. We focus our findings on these values to best situate Black identity and the adaptations (i.e., values and shifts in values) that supported their health and safety in the simultaneous navigation of two pandemics. In the findings, excerpts are attributed to "a/one member" absent of any qualifiers to focus on presenting a collective voice of Black engineering graduate students aligned with our methods.

8.1 | Black engineering graduate student-PTVF

Five values emerged as being critical to an ethos of survival and wellness for Black engineering graduate students and are shown in Table 3. Specifically, provenness or demonstrated ability, family and community, resistance, well-being, and freedom were the values that emerged as the Black engineering graduate student PTVF. While not comprehensive of all the students' espoused values, this framework reflects the shared collective of the values that were critical to this group of students at this time. The emerged values represent a commitment to family, community, identity, and self. These values also reflect the importance of mental health, racial equity, and freedom as students shifted toward the preservation of self in challenging times.

Table 2 shows the mapping of the Black engineering graduate student PTVF to both the Black Cultural Ethos and Schwartz's Values. More than half of the Black Cultural Ethos was uniquely aligned with values in the Black engineering graduate student PTVF, and only four of 10 values within the Schwartz model were aligned. This underscores a closer alignment between the Black engineering graduate student PTVF and Black Cultural Ethos than the Schwartz model. Additionally, the situating of the values aligned between the Black engineering graduate student-PTVF and the two models were different. For example, the family and community value is mapped to communalism in the Black Cultural Ethos and benevolence in the Schwartz Model. Communalism, from Black Cultural Ethos, is embedded in a collectivistic viewpoint that treats the individual and the family system and/or community as inseparable (Boykin, 1986). The Schwartz model's benevolence is described as a voluntary concern for others' welfare (Schwartz, 2012). The collectivistic ethos of communalism prioritizes the good of the group, while Schwartz's benevolence is motivated by individual gain such as the human need for affiliation. Applying only the Schwartz model misses key cultural aspects of the family and community values and so highlights the importance of applying theories reflective of cultural context. Specifically, our Black engineering graduate student-PTVF demonstrates the significance of Black-centered approaches to best understand Black realities and experiences.

8.2 | Shifts in values aligned with Black cultural ethos

In alignment with Black Cultural Ethos, Black graduate students identified well-being, family and community, freedom, resistance, and provenness as values essential to their navigation at the intersection of two pandemics. These

TABLE 3 Black engineering graduate students in pandemic times value framework.

Black engineering graduate student values in pandemic times	Meaning
Provenness or demonstrated ability	Members sought opportunities to demonstrate their knowledge and/or competence
Family and community	Members sought to protect and preserve those with whom they had a connection; members prioritized acceptance, integration, and/or representation of knowledge, customs, traditions, and practices of their people
Resistance	Members refused to accept their identity being ignored and marginalized; and/or promotion of radical expression
Well-being	Members prioritized the maintenance of their mental and physical health and overall being
Freedom	Members sought opportunities to choose the navigation of their pursuits, define the purpose, and encounter variety, novelty, and/or challenges in life

values were represented in terms of their manifestation or the ways the values were applied and/or expressed. These manifestations are shown in Table 2.

Manifestations of well-being included self-care, life being greater than work, and flexibility and adaptability. Manifestations of family and community included family and its importance, accessible community, and engaging with a shared identity. Manifestations of freedom included navigating as an individual rather than as a representative and multidimensional engagement, while manifestations of resistance included self-worth and self-compassion. Finally, the manifestations of provenness included maintaining productivity, predictability in executing a plan, and maintaining the integrity of responsibilities.

We applied the stem cell fate model to understand how members' values shifted during the time of the dual pandemics. This section will address values that were affirmed, developed, or removed. These values were deemed to be the most critical in that they were either relied upon more (affirmed), established out of need (developed), or found to no longer serve members (removed) in times of crises.

8.2.1 | Values affirmed

Well-being

A value that was affirmed for members was well-being. Members began to demonstrate agency in the prioritization of their physical and mental health as well as their personal safety in response to the pandemics. Well-being aligned with the Black Cultural Ethos of harmony, viewing one's fate as being interrelated with other aspects of life (Boykin, 1986). The two pandemics prompted the promotion of well-being through different mechanisms. Members elaborated on how COVID-19 pushed them to grow, and many mentioned a heightened appreciation of self-care, which primarily focused on their identification of and engagement in decompression activities. Members experienced more extensive periods of isolation, were removed from access to their typical outlets, and had to be creative in establishing activities within their spaces to maintain health and wellness, fight boredom, and fill empty time.

COVID-19 resulted in members valuing flexibility and adaptability. COVID-19 was not just a situation that pertained to a specific group of people. "Everyone" being upended meant empathy, understanding, acceptance, and others have to be flexible because "everyone" could relate because "everyone" was being impacted by a shared external stimulus:

> I think that I'm being a lot more lenient with myself in terms of routines, because I'm a very routine oriented person. And I guess the nature of the pandemic is that everyone, everyone's routine has been upended.

This aligned well with another manifestation of well-being expressed by members—that life was greater than work, which enabled them to adapt to necessary changes with the greater goal of prioritizing their health and safety. COVID-19 introduced a barrier to accessing the facilities, personnel, and norms of interaction that were typically available to them. As a result of the pandemics, members were forced to figure out how to maintain their duties as graduate student researchers and/or student leaders, which now threatened their well-being. Members decided to prioritize their physical and mental health, which often resulted in actions that felt incongruent with progress. They also revealed that the impact of COVID-19 depended upon their classification and area of study. Several of the members considered themselves "experimentalists," where lack of access to the lab equipment hindered their ability to make progress in their research. As one member explained, "so, as experimentalists we even have more of a burden to, you know, accommodate a lot of things during this time and going forward." Members described how they hoped COVID-19 would pass quickly as they could not really make progress. Thus, every day became "a reminder of [them] not moving forward."

Members were able to utilize their flexibility and adaptability to find other ways in which they could make progress. As one member reflected, "it's been a little rough, but it's been productive." Members contrived opportunities for forward momentum, as exemplified by one member developing a writing group and proactively initiating work on the writing of her dissertation. It was something she was going to have to do anyway, and since the final experiments could not be performed at the time, the student found another way to still be productive toward the goal of completing her PhD.

Members also became acutely aware that life was greater than work in the context of the experiences of the pandemics. Such was elucidated in one member's realization that "the lab was not life," which strongly resonated with the

group. This quote signified the realization that professional goals and milestones, while important, were not everything. Members also realized that metrics were not measures of their worth; the lab was acknowledged and limited to being a conduit for the achievement of their professional goals and dreams. The members' heightened awareness signified that achievement of goals without health, or perhaps sanity, held little value and/or significance.

Being forced to confront systemic racism impacted the sustainability of well-being among members. Specifically, their racial identity played a unique and vital role in shaping their position of life being greater than work. The undercurrent of racialized events (i.e., police murders of innocent Black lives such as Ahmaud Aubrey, Brianna Taylor, and George Floyd coincident with the onset of COVID-19 and spanning the summer of 2020) was shared in vivid detail broadly across news and social media. This, in turn, amplified the contrast in acknowledgment of the impact of the two pandemics by their academic institutions and research microcosms. The meaning-making of life is greater than work, exacerbated by endured neglect in such a critical moment, representing a shift in members' ethos toward *who I am becoming* is more important than *what I am working to become*. Members felt a need to be recognized for the layers and complexities of their experiences as Black people in the United States more, and necessarily so, than their identity as Black engineering graduate students, which was an identity that, beyond the walls of their academic communities, remained invisible to most of the world. One member earnestly portrayed the feeling of superficial understanding from people in their academic environments:

> Like it's, it's, it's no consideration of a Black student versus a white student versus a Brown student. Like it's just, yeah, we understand, we see what's going on, we'll, you know, send out an email, but still do your work or, like, still be productive or still, I still need that paper by today. You know, it's not, there is no, there is no one like reaching out and making sure everything is okay. Um, and even, even like the people from, from like, the diversity office like, like I work with, you know, the director of diversity for engineering, which is a white woman, really closely. She has never, she hasn't reached out to me [in this critical time] ... Like, it just feels, everything just feels surface level. Everything just feels superficial.

This quote emphasized how the experiences and pain of the members felt invisible. Specifically, in their academic communities, no one was concerned enough to reach out, not even the director of the diversity office. This also spoke to the expectation of support, particularly, in times of crises where one would assume it would be present. The expression of support as "surface level" and "superficial" suggested a reception of efforts from responsible stakeholders (i.e., administrators) as performative and lacking actionable support in the most critical of times.

The silence of the community, which exacerbated the isolation through the denial and/or failed acknowledgment of the experiences of Black people, and Black engineering graduate students, specifically, was equally damaging. Many members expressed anger and frustration in navigating the "cult of academia." They felt the academy had already demonstrated a "they don't want us here, but they can't force us to leave type of thing" sentiment to be an added stressor to the maintenance of their well-being:

> And it also makes me feel angry because it's like my advisor has yet to, has never even like asked me how I was doing with like holding up with everything going on or asked me if I needed to take a break or was I able to work, it was just kind of like, he's just completely oblivious. And I feel like everyone in my lab is completely oblivious to it. So, isolation, yeah, at its finest, for sure.

Members described their institutions' responses to systemic racism and injustice as "tone-deaf." They portrayed academia as "academia is like a cult" and "there was no consideration, work is still the priority." Members felt isolated and invisible based on prioritization of the work as the focus. They wanted their academic community to show an acute awareness of their experience navigating the two actively threatening crises impacting Black people. Similar sentiments were expressed across more student examples than can be presented herein.

These students' realities of their experiences with near silence in response to systemic racism juxtaposed with their awareness of the extensive acknowledgment, adjustments, and/or accommodations provided by these same institutional entities and research microcosms in response to COVID-19 clearly demonstrated real-time injustice and inequity. Students expressed being both hypervisible and invisible. One student attempted to create a contrast between the permanence of his Blackness to the ephemeral nature of COVID-19 for his non-Black academic peers. Attempting to help them grasp the tax of his identity, and an added tax he felt they did not have to pay, he said, "for you, this is a moment; for me, this is my life."

The maintenance of well-being across the pandemics challenged members to be innovative. Mainly, it pushed them to improvise ways of still making progress toward their goals and/or developing beneficial skills that would continue to serve them post-pandemic. Some members were also challenged by balancing their roles and responsibilities. This fostered "growth" resulting in them, as one member shared, being, "better at disciplining myself and doing things I should be doing." Many of the members held leadership positions and had to also address the needs of their constituents while managing their own individual needs. Members described these efforts as often having been executed without designated resources from the institution. Through different mechanisms, both COVID-19 and systemic racism motivated students to prioritize their well-being. At that moment, the priority became self-preservation of their identity and whole selves over their work.

Family and community

The uncertainty and isolation of COVID-19 placed an added emphasis on the importance of family and community. COVID-19 established a time when people desired to be close to those they loved. The imminent threat of the virus presented a significant challenge for students physically located at institutions away from home. While institutional responses to the onset of the pandemic varied tremendously, most graduate students were prohibited from going home. The threat of spreading and/or contracting COVID-19 itself was also an obvious deterrent from traveling. Members being at a distance from home and their families during such a critical time further elucidated how much family meant to them. Students described the worry their families held for them, and that they, too, worried about their families. One student detailed learning that more than 12 of her mother's direct coworkers had tested positive for COVID-19. As a result, she found herself "paranoid" regarding her mother's health. It was not at all a time when students felt comfortable being far away from family.

Members explicitly described the impact of COVID-19 as physical isolation. Several members reported engaging with their families virtually, more so than they had in the past, and they appreciated that as one silver lining of the pandemic. The importance of having access to the community became amplified as members were stripped of the counter spaces that had served as support. Many established virtual communities if they did not already have them. Their location and/or proximity to networks also influenced their modes of community-seeking. One student declared that her community in graduate school "had always been virtual" because of the nature of her work and collaborators. She also acknowledged the limited presence of identity-sharing individuals in her academic environments as influencing her need for a virtual network.

COVID-19 also necessitated the cancellation of many national meetings and conferences. One such cancellation was the 46th Annual Convention of the National Society of Black Engineers (NSBE). This conference was scheduled to be held in San Antonio, Texas in March 2020. Students reflected on this missed opportunity to be surrounded by peers that looked like them and held shared interests. There was a shared expression of how much they missed seeing the "smiling Black faces" as a valued, yet rare, experience at their TWIs. These sentiments highlighted intentional appreciation of presence and engagement with shared identity peers and networks:

> ... like in [the state I live in for school], you don't have, like you don't have it, right, I mean church and sorority ... that's where I see Black faces, and I can't go to either of those [in the current moment because of COVID]. And so, I was super excited about attending [the National Society of Black Engineers Annual Conference], specifically, because you're not only in a room with a ton of Black people, you're also in a room with people who have similar ideas that can also challenge your thinking ... they're on different paths ... I was definitely planning to get recharged there, and, you know, that kind of was, I mean, I think it'll probably be interesting to see it [done] virtually, but it definitely won't be like being there.

Access to critical masses of Black people in the geographic locations of their TWIs was found only in settings such as churches and Black Greek Letter Organizations. However, during this time, access to all these supports was removed. The NSBE conference served as an annual opportunity to promote agency while deviating from their daily environmental experiences in an empowering way. The members expressed lacking enthusiasm for a potential virtual NSBE Conference in its place. Their perception was that a virtual NSBE would lack the same power as the in-person interaction and experience.

Freedom

Faced with most professional realms of interactions shutting down, members were better able to identify the dimensions of themselves that remained once work was no longer the primary dimension of their overall identity. This

realization prompted members to value freedom, the encountering of variety, novelty, and/or challenges in life. The value was represented here by multidimensional engagement beyond the profession in which members sought new hobbies and/or dimensions to their identities. Some members took up a foreign language, others learned how to cook, and one even started making custom masks. It was also an interesting observation that multidimensional identity did not emerge as a value in the context of systemic racism. We posit that perhaps their Blackness, conceptualized as a role, was already challenged enough that further complexity of the role proved undesirable.

Systemic racism did, however, impact members' desires to navigate as an individual rather than as a representative, another manifestation of freedom. Members described wanting to be "free" of the burden of representing an entire race. In a time when the country was merely beginning to consider a long-endured reality for Black people, members desired to be seen as a "member of the Black community versus a representation of the Black community." In mapping to the Black Cultural Ethos, freedom related to expressive individualism is understood by its drive for the cultivation of personality and personal expression. COVID-19 encouraged members to expand their identities as an expression of freedom, whereas systemic racism presented the need for members to teach others how to treat them as unique individuals as opposed to another Black person.

8.2.2 | Values developed

Resistance

A value that developed for students in response to the pandemics was that of resistance or non-conformity. The value manifestations of resistance were self-worth and self-compassion, which mapped to the Black Cultural Ethos of affect.

The COVID-19 pandemic upended routines for everyone. For the students, it was this disruption that "forced" them to resist conforming to the socialized pressures of success. This value of resistance manifested through self-compassion and rebirth of self-worth through a commitment to unapologetically honor their needs in spaces where their voices were not well represented, and in engineering academic environments, specifically. For many students, they were unable to conduct their research, and their dissertation defense dates were postponed, indefinitely. One student recounted a major project that he was not going to be able to complete without access to human subjects. Students developed an understanding that they could only control what they could and found compassion for themselves when their performance may have paled in comparison to what they might have been able to produce under normal working conditions. As it related to COVID-19, one student shared:

> And I have a clearer sense of purpose. Like there is a life after the PhD and I have to think about that. What are my big, big, big dreams, and this is a stepping stone. It's not the end of the world. And I found that I've drawn strength in that kind of daily thinking, and that's been really helpful for me.

Conversations regarding health were easier because COVID-19 was a universal threat being faced by all. However, as it related to systemic racism, resistance involved the taking of an unapologetic pause to acknowledge the impact of race relations and dynamics on their individual functioning and mental well-being (i.e., being able to describe not being "okay"). Positive framing enabled students to envision the temporary period during the pandemics as a means to an end, which differed from the way self-compassion was framed as it related to systemic racism:

> If I was more weak minded, I don't know if I would finish [based on my experience in light of systemic racism], but I'm just going to finish because I finish everything I start. But I know that I don't want to stay in academia at all. I don't even have a desire.

In this case, their expressed self-compassion capitalized on their identity as a "finisher." Despite the difficulty of the situation, they decided to not allow the moment to derail them from achieving their goal. Notably, it was only because they identified as someone who completes what they set out to do that they planned to finish their PhD Another student shared candidly, "it's just too much to see the white faces on Zoom and act like I'm okay because I'm not okay." A deep resonance with this was shared across the group as individuals found their pain to be invisible or unacknowledged in their academic environments. This caused students to anchor themselves in a sense of self, and independent of the validation of others to confirm the reality of their endured and current injustices. As one student relayed:

> I'm definitely more blunt. I'm going to say what I want to say, how I feel. I felt that way with my advisor, and I appreciated him because he gave me about two weeks [following the murder of George Floyd] before he reached out. So that gave me the perfect time to, you know, kind of get my thoughts together. I didn't go to lab meetings. I didn't give him warning, I just didn't show up.

Students explained the need to protect their being and identity as Black people first, which was anchored in a shared sentiment of being misunderstood by the majority of those in their academic engineering environments as they were primarily all "the only one" or "one of few" with their racial vantage. In their resistance, students found confidence in their decisions not to pursue academia, which turned out to be the dominant sentiment of the group. All but one late-stage (3rd year or later) doctoral student in the group stated plans to leave academia after graduating due to the ongoing lack of "real commitment to real change" for Black students. As another student expanded, "[adding] to what he said about the decision to not continue in academia ... honestly, these past few months have made that kind of clear even more ... my decision is doubly sure, if anything, unless some miraculous offer comes from Mars." By framing self-compassion as an act of resistance, it shifted the responsibility of not wanting to persist in an engineering academic environment from them to the policies, practices, and cultures of the institution that perpetuate systemic racism. One member recalled:

> ... they've sent out you know, words saying like, 'oh, yeah, we condemn this, we condemn that,' 'we're against this,' 'we support our students,' 'we support our Blacks,' but like, nothing actually tangible. There have been three petitions to my knowledge that have gone to the President signed by a bunch of undergraduate groups, a bunch of graduate student groups, and faculty members about specific changes that can be made, and that should be made, and they've said that 'Yeah, there'll be a task force formed.' Um, they'll have a, we're going to create a Black council like building or room or something,' and it's just like, something, nothing actually tangible.

In their resistance, students recognized failure as attributable to the system rather than the self. Students became tired of empty words, "it's still just like, there is no change or there is no, no type of action. It's just words." Students did not feel guilty; rather, they felt violated by the lack of support and protection received to support their navigation at the intersection of crises. This invisibility and lack of acknowledgment left several students with adamant plans to pursue respite in industry and elsewhere.

8.3 | Values removed

This moment necessitated one value be completely removed. Prior to COVID-19, provenness or demonstrated ability manifested as maintaining productivity, predictability to executing a plan, and maintaining the integrity of responsibilities. Interestingly, this value was removed and was also the only value found to map solely to Schwartz's values. Specifically, provenness is mapped to achievement within the Schwartz model, which is a motivation for personal success through demonstrating competence according to social standards. Impacted by COVID-19, systemic racism, or both, the individualistic pursuit of success was not a prioritized value for the members during this time.

Many of the members described timelines and routines that they relied upon for an explicit awareness of tasks and for navigation of their academic work. However, COVID-19 challenged this value to the point of it being removed. Students were unable to maintain the prioritization of productivity in what became such a dynamic time riddled with uncertainty. The relinquishing of this value was also an attempt to maintain mental wellness by alleviating the pressure presented in trying to control the uncontrollable. As one student reflected:

> And then I was trying to take my mind off of it like, like by watching like movies or whatever, like just messing around or like reading or what not because even though I knew like focus on actually my research, it's like, I can't really progress, so every day is just a reminder of me just not moving forward.

Removing the reliance on provenness and demonstrated ability also promoted adaptability and flexibility, which is related to the maintenance of well-being.

It is worth highlighting that while COVID-19 and systemic racism both resulted in the removal of provenness or demonstrated ability, the manifestation of maintaining productivity showed up only with respect to systemic racism. Students did not see the point of work and were instantaneously launched into a mode of soul searching and efforts to define purpose. Although alternate routes toward productivity were identified as they related to COVID-19, systemic racism imposed a prioritization of self that empowered members to at times "not see the point of the work." Productivity ceased being the driving motivation in the presence of such larger questions surrounding greater purpose and responsibility. As an example, students contemplated whether they were on the right side of the fight. While they were "waiting to get back to the lab" to return to progress, many pondered whether they were missing their place in the streets (protesting for justice). This was significant in that it spoke to the added role strain experienced by Black graduate students. Being pushed to compromise productivity for the maintenance of self in the simultaneous pandemics demonstrated the conscious negotiation that is commonplace to the experience of Black students.

9 | DISCUSSION

This work amplifies a collective counternarrative of Blackness through the voices of Black engineering graduate students. It is grounded in a methodological execution that we hope effects change for the community. In this discussion, we describe the framework that emerged and the differential impacts of each of the pandemics on the members. We have intentionally described the findings thus far in terms of our members. However, for the discussion, we will reposition their voices as Black engineering graduate students and refer to them throughout as students.

9.1 | A Black cultural ethos

The duality of living in the moment as both a Black person in America and a Black graduate student navigating engineering induced perturbing, destabilizing, and immobilizing effects. The effects, in turn, pushed students to reprioritize their values. Situating the work in the Black Cultural Ethos allowed us to center Blackness and enabled the observed phenomena to be understood from a vantage of cultural significance. Students expressed nonconformity to oppose socially imposed expectations incongruent with Black identity and experiences. Students also had an amplified sense of obligation to protect their families and preserve the notions of culture associated with Black identity.

While values in the time of crises mapped to both Black Cultural Ethos and Schwartz's theories, Black students had greater alignment and resonance with culturally centered values. Ideals of achievement became inferior to those of harmony, and motivations for individual success became overshadowed by concern for the collective. This comparison of students' resonance with the Black Cultural Ethos over that of Schwartz' Basic Values—known for its validation across dozens of cultures internationally, and yet, still incongruent to the Black experience—yields insight into the ongoing injustice that Black graduate students navigating engineering academic environments centered in Eurocentric ideals endure. As Boykin described the realms that Black students negotiate—mainstream, minority, and African culture—it is a reminder of the complex existence of Black identity that students encounter as they struggle to be understood in the significance of their culture and strength in environments where their values are not centered.

Black engineering graduate students intentionally prioritized their mental and physical health over success and/or productivity in their professional pursuits in the adoption of a cultural ethos. Past research describes Black STEM graduate students as focused on academic success at the cost and sacrifice of self-care, health, and/or well-being (McGee et al., 2019). It is plausible that the reversal observed in the current study might be an artifact of resistance and protest resulting in Black students' real-time realizations that life was more important than work and that self-worth and self-compassion were imperative for survival amidst the constraints imposed by the pandemics. McGee et al. (2019) also described Black students to be reluctant to acknowledge race as a factor in how their experiences deviated from that of their peers. Results of the current study found that Black graduate students swiftly contextualized their experiences in terms of race, largely made possible by the indisputable difference in how the two pandemics were addressed and handled by institutions.

9.2 | Differential impact of the pandemics

COVID-19 involved sacrificing progress for individual safety. With systemic racism, the preservation of one's identity was front and center even with the consequence of being misunderstood. The idea of systemic racism was not "new" to

Black engineering graduate students but had been brought to light publicly through instantaneous national attention mandated by the horrific murder of George Floyd. Students were paralyzed by feelings of invisibility created in real-time in their greater engineering environments. These feelings were affirmed by the institutional and societal responses students observed in relation to the two pandemics.

What became clear in terms of values was that COVID-19 induced value changes that challenged students' rigidity. This is evidenced by the value manifestations of predictability in executing a plan and flexibility and adaptability, which were uniquely associated with COVID-19. Systemic racism instead challenged students' personal identities. This was underscored by the value manifestation of navigating as an individual rather than as a representative, which was the only value manifestation to be uniquely associated with systemic racism. Systemic racism forced students to protect their identity and sanity at the expense of their ability to function in their usual roles such as graduate student researcher and student organization chapter president.

Participants described shared similar values with others in their academic community with respect to COVID-19 and expressed a tremendous amount of invisibility and hypervisibility regarding experiences relative to systemic racism. This was supported by the promotion of both harmony and resistance, which was formed as a value for Black engineering graduate students. The value that was developed aligned with the Black Cultural Ethos whereas that which was removed, provenness, aligned with Eurocentric values. While both systemic racism and COVID-19 contributed to their well-being, in the maintenance of their mental health, students named systemic racism as the greatest threat.

Values around multidimensional identity did not emerge with respect to systemic racism. This was perhaps due to already having to be multidimensional based on the role strain expressed as significant for Black engineering graduate students. An individual's values are an extension of one's identity. Yet, while Black students had values unmet in their academic environments, an expectation for them to persevere remained. As blooms would never be expected from plants unwatered, such expectations further perpetuate the invisibility Black students feel through demonstrations of anti-Black sentiments.

Overall, the findings demonstrated students' values are impacted differently by COVID-19 and systemic racism. In the expressions of the students, their "being Black in engineering," had come with long suffering and unawareness. Yet, the institutional responses to COVID-19 quickly resulted in policy changes. Students at some institutions were even granted additional years of funding to offset any incurred hardship of the current moment as related to COVID-19. In response to systemic racism, institutions drafted letters—with several being slow to release those—with what was perceived as "empty words" of the institution. From the vantage of Black students, short-term suffering impacting everyone in the community resulted in the establishment of immediate accommodations. In contrast, long-term suffering impacting only Black students, staff, and faculty—and specifically those navigating engineering environments—persisted with little resulting action. While being approached with inquiries on how engineering could "be made better for Black students," these students were forced to process why their known suffering had still not been enough to evoke necessary and transformative change. There was a sustainable and continuous improvement element to how COVID-19 was being handled absent of similar reciprocity of effort with regards to systemic inequities.

Another major finding involved a paradox in the mechanisms of impact manifestation presented by COVID-19 and systemic racism. COVID-19 triggered a response that required distance and isolation. It also contradicted, and by nature, inhibited, the prompted engagement through activism that took many from seats to the streets in masses in response to systemic racism. As students reprioritized their values, they contemplated whether the purpose they were working toward in their doctoral studies was the work that mattered. For many, the moment promoted a desire to align their personal and professional energies with the liberation of their identities in a cause "worth fighting for." A similar motivation to do work for social good that connects back to the people and/or communities of significance has been demonstrated for Black and Brown students in STEM (McGee & Bentley, 2017).

Further compounding the students' agency to employ self-worth was that the promise of solidarity from their institutions came with them still being the only Black person, or one of few, in their program and/or department. As a result, students held on to values of well-being, family and community, resistance, and freedom to overcome the threat of uncertainty. They wanted to feel like they belonged. In environments where students were made to feel their Black identity was not prioritized, they focused on self-care, connected more and consistently with family, sought accessible community, if only virtually, and developed self-compassion, that is, not attending lab meetings when they knew they were not "okay." Students established self-compassion as their own permission to sustain their safety and stability—physically, socially, and mentally. Studies have shown mental stability and safety to be significant parts of the journey for marginalized students in STEM (Wilkins-Yel et al., 2022).

10 | IMPLICATIONS

We must invest in awareness and understanding of values and worldviews differing from the Eurocentric norms in which engineering was established and has been socialized to espouse. *If the experiences of Black engineering graduate students during the pandemics represent who we are as an engineering culture, what does that say? How do we expect students to ignore the messaging behind accommodations being received for one pandemic and not for another?* Students were able to overcome COVID-19-related challenges, but the influx of racialized murders during an isolating pandemic left students incapacitated, and yet nothing was "done."

Further, we believe the power of these findings to be far-reaching. While the study sample is small, it is a representative microcosm of Black engineering graduate students nationally. This study population is highly representative of Black student experiences across several TWIs ($n = 8$), varied engineering disciplines (biomedical, mechanical, computer science, chemical and computational modeling and simulation), and various status levels (early to late PhD students). The commonality across experiences of the students in this sample warrants a responsibility for the researchers to be reflective in synthesizing the findings for implications. To mitigate the watering down of the necessary actions elucidated through this work and as a true effort to cultivate antiracism, the authors are intentional in the articulation of the following implications. Relatedly, there are several key takeaways that have implications for (1) research methods employed to study the experiences of Black engineering graduate students; (2) approaches institutions use to support Black engineering graduate students; (3) policy and practice; and (4) the potential for research to serve as activism.

10.1 | Methodological implications

Methodologically, the findings here imply the need for future studies to combine phenomenology and community-based participatory research. To our knowledge, we are among the first to employ these methods together in the context of engineering education research. Such approaches simultaneously advance our understanding of the experiences of marginalized groups while empowering their agency. Here, as outcomes of this comprehensive approach, we were able to understand the "essence" of the experience, support culturally sensitive research practices, and elicit the concerns of a specific group as co-creators of knowledge while positioning them to effect change from research findings. Students expressed their elation for the opportunity to have a rapport with the researchers in a way that allowed them to consider and discuss their experiences in the current moment while navigating engineering. Prior to this study, none felt anyone had previously inquired to know of their experiences or had created a space for them to do so. For many, it was the first, and potentially only, place they would experience such a space.

This work put forth a theoretical development and framing as one way to spur our awareness, understanding, and creation of space for non-Eurocentric worldviews and values through scholarly pursuit. James Baldwin also astutely situated, "The paradox of education is precisely this—that as one begins to become conscious one begins to examine the society in which he (sic) is being educated." Theory development should be dynamic and is needed to support the growth of the field and horizon fluctuations across various climates of inclusivity. Scholarship that fails to uncover and develop new, inclusive cultural theories is akin to a government living under the same rules for hundreds of years without change. As society grows and adapts, so should the instruments used to understand them.

We must embrace the examination of our current ways of doing and encourage the development of new epistemologies and theories anchored in transformative justice, those focused and intentional in serving marginalized populations in context to the current sociopolitical landscape. Research based on theories centering on the experiences of the marginalized will promote a more significant meaning-making of data by anchoring the work in the experiences of its participants.

10.2 | Institutional implications

A major implication for institutions from this work is that they must learn what Black engineering students value. Further, once these values are elucidated, a strong commitment to action aligned with and supporting the cultivation of such values is imperative. Black students viewed institutions as paying lip service to words of diversity, equity, and

inclusion that were unmet with real action. Academia missed a major opportunity to create environments where Black graduate students felt visible, included, and understood in recognition of endured racial injustices.

Studies highlight the importance of more diverse faculty and inclusive environments to truly broaden participation in the field (Main et al., 2020). Standing to lose those closest in succession to populate these positions (i.e., doctoral students) poses a significant threat that cannot be ignored. In the findings presented here, students explicitly stated that experiences of insufficient institutional response to systemic racism influenced career trajectory decisions, moving them away from academia in engineering. These students were successful scholars and emerging talents in their respective fields. They included published scholars, NSF Graduate Research Fellowship Program Awardees, and national lab-decorated students. Another potential implication for institutions is the importance of more intentional integration of the voice of students in informing how they are acknowledged and/or supported. Such have been the foci of more recent efforts to consider Students as Partners (SaP), situated in a values-based ethos, which works to integrate the voice of the student in shared practices (Mercer-Mapstone et al., 2017). Though positive outcomes of these efforts have largely surrounded teaching and learning, such could prove to be a more effective way of creating environments where doctoral students feel visible, included, and considered. Similar approaches could be taken to understand the additional roles, responsibilities, and vantages that students from non-majority groups hold as they navigate the environment, intentionally shying away from the size-fit approach to graduate engineering education.

10.3 | Implications to policy and practice

Rather than force assimilation to and acceptance of Eurocentric worldviews, values, and values specific to engineering, institutions must have a greater awareness of and accountability for the ways in which anti-Black racism is perpetuated in academic environments. Antiracism requires an active reconstruction that involves disruption of the status quo. The onus must be placed on institutions to develop and enforce measures of accountability that prescribe real and transformative change. There must be intentionality and accountability to mirror a comparable level of continued care, compassion, and concern to that which has been exhibited in response to the COVID-19 pandemic. This work enables our understanding of how students' trajectory decisions are related to their willingness or unwillingness, to persist in such environments.

10.4 | Implications for research as activism

The findings here also imply that there is an opportunity for engineering education stakeholders to more frequently engage in and act in response to purposeful activistic research. With respect to their racial identity, students in this study placed a heightened emphasis on their voices, vantages, and worth in the field. Their protests at this moment were unapologetic, and by understanding this moment for themselves, the students' next steps motivated them to challenge their institutions to do more with regard to social justice. We believe this was largely made possible through our intentionality to adopt a community participatory research design, and we encourage other researchers to adopt and create similar opportunities.

11 | CONCLUSION AND FUTURE WORK

As a result of the dual pandemics, Black engineering graduate students were made to (re)consider, (re)define, and (re) prioritize their values. Students gained awareness of their original (pre-pandemic) values in their exploration of and reflection on their lived experience at the intersection of two pandemics. The mode of self-preservation in which most members were operating impacted their desire to adopt values that fostered and supported their sanity, community, doing of work that matters, and refusing to be silent. These values were each found to be critical and necessary to survive in that space and time. We established a framework centering on the values of Black engineering students which prioritized a sense of belonging and freedom. We also learned that COVID-19 and systemic racism differentially impacted Black students with systemic racism having a more significant impact on mental health and well-being. This study highlights the importance of understanding student values, and how perceived misalignment can influence career decisions that push superior engineering talent away from academia. Black students prioritized values associated with a Black Cultural Ethos as essential for survival amidst the two pandemics.

Future work will seek to use the values framework developed in this study to investigate the degree to which these values are retained in a larger sample of Black engineering students using a mixed-methods investigation. Additionally, we will investigate whether such values are differentiated across domestic and immigrant Black students. We hope future research will leverage this framework as a starting point for conceptualizing the values underpinning Black graduate students during times of crises.

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