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RESEARCH ARTICLE

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#Resilience is not enough for Black women in STEM: Counterstories of two young Black women becoming a STEM person

Roxanne Hughes[1] | **Amal Ibourk**[2] | **Lauren Wagner**[3] | **Kelli Jones**[4] | **Samantha Crawford**[4]

[1]Center for Integrating Research and Learning, National High Magnetic Field Laboratory, Tallahassee, Florida, USA

[2]Science Education, School of Teacher Education, Florida State University, Tallahassee, Florida, USA

[3]School of Teacher Education, Florida State University, Tallahassee, Florida, USA

[4]Tallahassee, Florida, USA

Correspondence
Amal Ibourk, Science Education, School of Teacher Education, Florida State University, 1114 West Call Street, Tallahassee, FL, USA.
Email: aibourk@fsu.edu

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Abstract

Both K-12 schools and STEM disciplines are embedded in White supremacy and exclusion, making it that much harder for Black women to maintain an interest and sense of belonging in STEM. Through a Critical Race Feminism methodology, we tell the counterstories of our two co-authors, two Black women, over the course of their lives. Through these counterstories (stories that run counter to normative stories of STEM as male and White), Kelli and Samantha show us how they negotiated and maintained a sense of belonging in STEM even through moments of self-doubt in their STEM trajectory. These negotiations allowed them to carve a space for themselves within STEM. A key finding from these counterstories was the resilience both women developed through their participation in counter-spaces and support from family and teachers that helped them develop pride in their STEM identity trajectories. Our study adds to the research on Black women's journeys in STEM by describing resilience strategies that our authors were forced to develop in response to White supremacy and how they were able to maintain their STEM identity by creating a counterstory that allowed them to maintain their sense of belonging within STEM. And yet, we conclude by asking if resilience is enough since both women questioned their authentic and valued place in their

respective STEM disciplines because of the dominant storyline of STEM as White and male. Their stories reveal the deeper truth that change is needed in STEM to empower students of color to see themselves as not just tolerated but valued members of the discipline.

KEYWORDS

Black women, counterstories, critical race feminism, STEM identity

1 | INTRODUCTION

Black women are severely underrepresented in the STEM workforce compared to their representation in the US population (National Science Foundation [NSF], 2021). This underrepresentation of Black women is not simply a lack of interest or access, rather a large cause is the White supremacy inherent in the creation and sustaining of multiple US systems (e.g., laws, education, housing, bank loans) and institutions (e.g., K-12 schools, higher education) (Collins & Bilge, 2016; Ladson-Billings, 2009b; McGee, 2020). STEM fields thrive on exclusion (Joseph et al., 2017; Morton et al., 2019; Nasir, 2012). Success is deemed worthy to those who fit the stereotype (i.e., lone White male scientist) or have access to STEM experiences in school as well as outside of school that can sustain their interest (Ferguson & Martin-Dunlop, 2021; Leyva, 2021). Not only have Black women been ignored by STEM, but they have also actually been abused by these fields (e.g., early gynecological studies in the United States were performed on Black women slaves without consent or value for their lives) (Gholson & Martin, 2019; Morton et al., 2019; Prescod-Weinstein, 2021). Black women were denied access to STEM programs longer than Black men or White women. Consequently, Black women as individuals and as a collective are recovering from historical trauma and oppression within STEM (Morton et al., 2019). K-12 schools are not exempt from the interlocking oppressions of sexism, racism, classism, nationalism, and heterosexism and have historically caused trauma for Black bodies (Collins & Bilge, 2016; Hancock, 2016; Nasir, 2012; Ridgeway & McGee, 2018). Research that gives Black women an opportunity to tell their stories to both counter and disrupt the current White supremacist storyline allows us to uncover the interlocking oppressions that prevent Black women and girls from thriving in STEM (e.g., Morton et al., 2019; Morton & Nkrumah, 2021; Ridgeway & McGee, 2018; Russell & Russell, 2015). This paper not only describes the counterstories of two Black women (Kelli and Samantha) but also includes them as co-authors to demonstrate how researchers in connection with Black women in STEM can disrupt the dominant storylines and change STEM to improve Black women's experiences and sense of belonging.

2 | LITERATURE REVIEW

2.1 | Gender and racial biases in STEM

A perception surrounding that has access to STEM has largely remained consistent across the last four decades as evidenced by multiple Draw a Scientist Test (DAST) studies. Scientists are still portrayed and perceived as White, middle-aged, or elderly men, donning long coats and working

in a lab indoors (Ferguson & Lezotte, 2020; Miller et al., 2018; Walls, 2022). These pervasive stereotypes associating science with White men appear as early as age 4 (Chambers, 1983; Hayes et al., 2020; Miller et al., 2018). Racial bias related to STEM is also evidenced early in children's development (Walls, 2012, 2022). These DAST studies that focus on racial drawings of scientists show that they are largely portrayed as White; even by students of color (Türkmen, 2008; Walls, 2012, 2022).

2.2 | Issues affecting Black girls in K-12 STEM

These DAST studies highlight the gendered and racial stereotypes associated with STEM that can prevent certain students, particularly Black girls, from seeing themselves as scientists. Other studies have highlighted that the sexism and racism inherent in society—and consequently K12 schools and STEM—surrounds Black girls and shows them the dominant storyline of who belongs and is valued in school and STEM—White students (Carter Andrews et al., 2019; Collins & Bilge, 2016; Gholson & Martin, 2014; Joseph et al., 2017; Ladson-Billings, 2009b; Nasir, 2012; Ridgeway & McGee, 2018). Black girls determine whether they belong in STEM school spaces or if they can succeed in these spaces based on their interactions and observations in classes (Gholson & Martin, 2014, 2019; Ladson-Billings, 2009b; Ridgeway & McGee, 2018). As Ladson-Billings (2009b) describes, Black girls are often trying to engage and be recognized for their contributions in spaces and within systems where they are fighting the dominant storyline that portrays Black women as "unattractive, morally suspect, and incompetent" (p. 87). Current research shows us that the outcomes of these stereotypes (stemming from racism and sexism) create situations wherein Black and African American girls are tracked and not positioned to be recognized by educators and peers as science people, which affects how they see themselves as potential science and math people (Gholson & Martin, 2014, 2019; King & Pringle, 2019; Rahm et al., 2021; Wade-Jaimes et al., 2021; Wade-Jaimes & Schwartz, 2018). These stereotypes influence how teachers and peers label and treat students as smart or even as belonging in school and more specifically in STEM (Gholson & Martin, 2014, 2019; King & Pringle, 2019; Wade-Jaimes & Schwartz, 2018). As individuals move through, around, to, and from these science spaces, they begin to see how certain identity performances are available, imposed, or closed to them based on their race, gender, and other marginalized identities (Gholson & Martin, 2014, 2019; Gonsalves, 2020; Ingold, 2011). Consequently, the ongoing stress of constantly being constrained by the negative stereotypes within K12 science and math classes can lead to disengagement or outright contempt for these subjects (Calabrese Barton et al., 2013; Gholson & Martin, 2014, 2019).

2.3 | Issues affecting Black women in college STEM

The systemic racism inherent to both STEM and higher education is deeply felt by Black women in college STEM majors (McGee, 2020; Morton & Parson, 2018; Smith et al., 2019). Black women in STEM majors face social isolation, academic difficulties, and financial stresses, leading to feelings of alienation, which continues into graduate school and careers (Farinde & Lewis, 2012; Johnson et al., 2011; Ko et al., 2013; Margolis et al., 2011). McGee argues that the current colorblind ideology in both higher education and STEM promotes unhealthy forms of resilience for Black women (e.g., grit and perseverance that take an emotional and physical toll) and ignores

"the social, political, and educational systems that continue to abuse and neglect (Black women's) bodies and minds" (McGee, 2020, p. 635). Like the research in K12 science and math spaces, higher education researchers, like McGee (e.g., McGee & Bentley, 2017), who acknowledge the systemic racism and sexism within STEM, often utilize a counterstory methodology. Research on counterstories of undergraduate Black women in STEM majors has found that these stories "offer insight into individuals' strategies of survival and resistance in navigating sociopolitical contexts" (Leyva, 2016, p. 90). Black women, who persisted in STEM in these various studies, found some supportive peers and faculty that strengthened their counterstory and resilience but this could not fully protect them from the racial battle fatigue experienced by Black women as they negotiate the lived reality of exclusion within the oppressive systems of STEM to carve out spaces for themselves (Leyva, 2021; McGee & Bentley, 2017; Morton & Parson, 2018; Ortiz et al., 2019; Smith et al., 2019). These studies have mainly focused on college-age Black women's counterstories within that particular educational period. Our study adds to the research by empowering our co-authors to describe their counterstories over their entire educational trajectory, focusing on the culminating influences of Informal STEM Educational (ISE) spaces, K-12 STEM spaces, family, and college STEM spaces, and how they see themselves as STEM people.

2.4 | The connection between counterstories and counterspaces

Nasir (2012) advocates for tools, including counterspaces, to help Black girls and women learn how to resist racial and gendered storylines and create positive racial, gendered, and STEM identities. A counterspace is a site where deficit mindset stereotypes defined by racism and sexism can be challenged as members of the counterspace build collective support and individual confidence (Solórzano et al., 2000; Solórzano & Yosso, 2002). Counterstories are often tied to counterspaces, as Black girls participate in these counterspaces they can add to their counterstory and develop resilience to the dominant narrative within STEM. Often these counterspaces are created outside of the traditional science and math classroom, such as ISE spaces (Joseph et al., 2017, 2019; King & Pringle, 2019). These studies highlight how Black girls' experiences within counterspaces help them to create or add to their counterstories. Often the development of a counterstory can only be seen by Black girls after they engaged in a counterspace where they were given opportunities to challenge the dominant ideology and narratives of STEM as White and male (King & Pringle, 2019). Nicole Joseph et al. (2017, 2019) identified three key features of counterspaces: (1) structural disruptions, permanent as well as short-lived opportunities or experiences, such as culturally responsive educators and mentors, (2) community influences, the network created within counterspaces where Black girls can come together to affirm and strengthen their identities as STEM people and solidify their sense of belonging in STEM; and finally (3) resilience strategies that include stereotype management and counterstories (McGee, 2013) that help Black girls to manage the societal stereotype that portrays them as less than or not capable of moving toward STEM success and belonging (McGee & Martin, 2011). Not only do these counterspaces give Black girls' resources directly during their participation in ISE programs, but they also give them lasting counterstories that they could draw upon in their experiences outside of the counterspace to continue to author their STEM identities (Tan et al., 2013). This research highlights how Black girls and women have developed resilience strategies in STEM at the K-12 and college level, which are different from Black boys and men, and other girls and women, because of the unique impact of racism and sexism. These studies focus on short-term effects of counterspaces whereas our study follows our two

co-authors over time to see how their resilience strategies were developed and utilized over time from the K-12 level through college.

3 | THEORETICAL UNDERPINNINGS

We, the authors, approach this research with the knowledge that the underrepresentation of Black women in STEM is attributed to societal perceptions that associate these fields with Whiteness and maleness, leading Black women and others to question their sense of belonging and potential for success in STEM (Collins & Bilge, 2016; Ladson-Billings, 2009b; McGee, 2020). Because of this understanding, we combined the lens of STEM identity with Critical Race Theory (CRT) to account for the systemic and structural racism and sexism that inhibits STEM identity development for Black women.

3.1 | STEM identity

STEM identity research has highlighted the importance of a sense of belonging, where individuals need to believe that they belong in their chosen STEM field based on both internal and external recognition (Carlone & Johnson, 2007; Gonsalves, 2020; Kim et al., 2018). To have a strong STEM identity, individuals must recognize themselves as accepted members of STEM and be recognized by others as accepted members as well (Kim et al., 2018). Researchers have highlighted how other identities intersect with and influence STEM identity, particularly for Black girls and women, and the inherent power differentials and politics of recognition that shape and influence who feels included in STEM (Avraamidou, 2020, 2022; Ibourk et al., 2022; Johnson, 2020; Rahm et al., 2021; Smith et al., 2019; Wade-Jaimes et al., 2021; Wade-Jaimes & Schwartz, 2018).

Along similar lines, Carlone and Johnson (2007) viewed science identity as comprising three dimensions: (a) competence via knowledge and understanding of science content, (b) performance of relevant scientific practices, and (c) recognizing oneself and being recognized as a science person. STEM performances and being recognized (both internally and externally) are influenced by broader power dynamics that inform the stories individuals tell about their own STEM belonging, particularly for Black women (Collins & Bilge, 2016; Ibourk et al., 2022; King & Pringle, 2019; Miles et al., 2022; Morton & Parson, 2018; Rahm et al., 2021; Smith et al., 2019; Wade-Jaimes et al., 2021; Wade-Jaimes & Schwartz, 2018). For example, Black girls and women may have brief experiences where they see themselves as capable in STEM (i.e., recognition), but the dominant narrative of STEM makes it difficult for them to see themselves as belonging and succeeding in these fields—other identities such as their gender or racial identity can hold them back from feeling like they truly or fully belong (Hazari et al., 2020). To better uncover this dissonance between belonging and the dominant narrative of who belongs in STEM, we chose to combine our STEM identity lens with intersectionality and Critical Race Feminism (CRF) perspectives.

3.2 | Critical race feminism

CRT (Crenshaw et al., 1995) examines the various forms of oppression that affect people of color (Ladson-Billings, 2009a, 2009b; Pérez Huber, 2010) due to the intersectional experiences

of marginalization and empowerment (Crenshaw et al., 1995; Ladson-Billings, 2009a, 2009b; Pérez Huber, 2010; Wing, 2000). CRT is grounded in social justice and offers researchers a transformative response to racial, gender, and class oppression, by centering voices that have been marginalized in society. Because our study focuses on Black women's STEM identity development, we chose to incorporate CRF, a lens that stems from CRT. A CRF lens expands our understanding of STEM identity development within the broader matrix of oppression as it "offers the most nuanced and straightforward framework for contending with the social, economic, political, and educational problems confronting Black female students inside and outside of schools" (Evans-Winters & Esposito, 2010, p. 23). A CRF lens also recognizes how the devaluation and marginalization of Black women in STEM are rooted in sexism and racism and how evidence of this oppression can be seen in the underrepresentation of Black women in STEM within a White male patriarchal system (Evans-Winters & Esposito, 2010; Miles et al., 2022; Wing, 1997). Specifically, our use of CRF draws explicitly on the lived experiences of Black women through storytelling and counterstory (Evans-Winters & Esposito, 2010; Miles et al., 2022). Through CRF, we center our co-authors' voices through counterstories. As such, we are empowering Kelli and Samantha by giving them space to tell two counterstories to the dominant White supremacist STEM narrative (Mensah, 2019).

3.3 | Connections between the frameworks

Black women's STEM identity development does not occur in a vacuum as these women's visible salient identities come into conflict with the dominant and privileged identities rewarded by STEM (Evans-Winters & Esposito, 2010; Mensah, 2019; Miles et al., 2022; Wing, 1997). Black women's sense of belonging is affected by power dynamics on the macro (social and cultural) and micro (classrooms) levels in combination with the stories individuals tell themselves related to STEM (Joseph et al., 2017; Ladson-Billings, 2009b; McGee, 2020; Morton et al., 2019; Nasir, 2012). For our study, we saw STEM identity as part of the story that Kelli and Samantha told about their lives. Because of the dominant narratives of who belongs and succeeds in STEM, both women had to develop counterstories to maintain their STEM identities. These counterstories were influenced by counterspaces that both women participated in during their STEM identity trajectories. Hence, these counterstories, strengthened through participation in counterspaces, serve as stories and memories of resilience in STEM because they center Black women's strengths and value in these fields (Leyva, 2021; McGee & Bentley, 2017; Morton & Parson, 2018; Ortiz et al., 2019; Smith et al., 2019). To truly center the counterstories of our participants in the White, male, and patriarchal system of academia, we have included them as co-authors to demonstrate the value of their experiences and stories within STEM identity research. The study was guided by the following research question:

1. How do the counterstories shared by two Black women (Kelli and Samantha) shape their STEM identities and resilience?

4 | METHODOLOGY

To answer our research question, we employed a CRF methodology (Evans-Winters & Esposito, 2010; Miles et al., 2022). This methodology highlights Black women's experiences as strengths

rather than deficits and offers an opportunity for liberatory or transformative solutions to racial, gender, and class subordination (Evans-Winters & Esposito, 2010; Solórzano & Yosso, 2002). To account for race and gender, we utilized counterstorytelling, a CRF methodology that allows Black women to voice their counterstories from an asset perspective centering the racialized and gendered experiences as sources of strength (Ibourk et al., 2022; King & Pringle, 2019; Mensah, 2019). The term counter is used because these experiences counter the dominant narrative of who belongs and can succeed in STEM. (Re)telling explicit counterstories is an empowering act (Solórzano & Yosso, 2002) as it centers and amplifies the voices of Black women who have been historically underrepresented (King & Pringle, 2019). Through counterstories, Samantha and Kelli could contextualize their experiences within STEM to author their STEM identities and challenge the "normative" stories of Whiteness in STEM.

4.1 | Participants and setting

We met Kelli and Samantha in 2010 and 2011, when they were 11 and 12 years of age, respectively, as participants in an all-girls STEM camp (STEM Girls). STEM Girls began in 2006 as a middle school all-girls summer science camp at a large research institution in the Southeast. The goal of STEM Girls is to introduce middle school girls to diverse STEM fields and role models, thereby expanding, improving, and/or sustaining their interest in STEM. Participating girls meet from 9 a.m. to 4 p.m. each day and engage with women role models and hands-on activities connected to the role model's careers so that they can see different STEM career options and their potential success in these fields. Girls complete pre- and post-survey during their camp experience. These surveys include open-ended questions that ask the girls why they are interested in STEM, what career they are interested in, and what they picture when they picture a scientist. Girls can participate for up to two summers. The director of the STEM Girls program sends periodic surveys to alumni to invite them to participate in follow-up interviews to gather data on their individual STEM identity trajectories. Kelli and Samantha have both stayed in touch with the STEM Girls staff and participated in these periodic interviews. Table 1 provides detailed descriptions of the life histories of both Samantha and Kelli, with counterspaces bolded.

We chose to center the counterstories of Samantha and Kelli for this paper because we had data for them each year that they participated in STEM Girls and because they were at similar points in their educational trajectories (i.e., completing their fourth year of college). During our interviews with them in college, we realized they had been friends since childhood. As we engaged in clarification questions with them about their survey responses from STEM Girls and interview transcripts, we realized that as Black women, they should not just have their stories told but be the storytellers, hence, our decision to offer them co-authorship, which they readily accepted. The resulting counterstories are told across time and highlight two very distinct and different STEM identity trajectories despite sharing a love for STEM.

4.2 | Positionality

The first author is a White middle-class woman, who is the director of the STEM Girls camp and studies the impact of educational programs on girls' STEM identity. She has known Kelli and Samantha since they attended STEM Girls. She recognizes that her experience as a White

TABLE 1 Participant profiles.

Life stage	Kelli	Samantha
Early life and family	The family are not scientists but supported her interest in science, enrolling her **STEM girls** and encouraging her to participate in internships.	The family are not scientists but supported her interest in science, enrolling her in **STEM girls** and other science camps.
	Her mother earned her master's while Kelli was in high school.	Her mother is a faculty member at a university.
	Her parents encouraged her participation in **internships at a local HBCU** and to **attend an HBCU for college**.	Her parents encouraged her participation in programs at a local **HBCU (e.g., a Science Fiction camp** with her father).
STEM girls participation	Attended **STEM Girls** in the summers of 2010 and 2012 when she was 11 and 13 years of age.	Attended **STEM Girls** in the summers of 2011 and 2012 when she was 12 and 13 years of age.
High school	Maintained interest in STEM and participated in **internships at a local HBCU** where she worked with another Black STEM Girls alumna.	Maintained her interest in STEM in high school through school coursework.
College	**Attended a Historically Black College and University (HBCU).** She enrolled and graduated as a biomedical engineering major.	Attended a Predominantly White Institution (PWI). She initially was planning to major in chemistry. In her sophomore year she switched to English.
	She is currently debating options for graduate school, including public health or physics.	She graduated with an English degree and is currently pursuing a master's degree in creative writing.
	Life History interview in the summer of 2021 before her final and fifth year of college.	Life history interview in 2021 just after she graduated from college.

woman in STEM limits her ability to fully understand the experiences of Black women in STEM. As a result, she tries to empower these women in her research through member checking and co-authorship. She conducted the interviews, member checking, and group data analysis. Because she holds some bias as the STEM Girls camp program director, the second and third authors served an active role in checking for discrepant evidence in their counterstories.

The second author is a female immigrant from North Africa. Her racial identity is a mixture of Arab and Amazigh, which is an indigenous group of North Africa. She is a first-generation college student. She has expertise in using counterstorytelling to understand STEM identity and her own STEM story. Although she identifies as a woman of color, she fully acknowledges that her experiences are different from the experiences of Black women, like Kelli and Samantha, in STEM. She provided her expertise in research design and data analysis.

The third author is a White woman who is a PhD student in education, specifically focusing on systemic racism in elementary school classrooms. She recognizes that her experience as a White woman in STEM areas limits her ability to fully understand the experiences of Black women in STEM. During the research and writing process, she helped write the literature review section and to search for discrepant evidence and negative cases during the data analysis.

The fourth and fifth authors are the voices of this research and helped us to reimagine a STEM that includes a culture of care. Kelli is a Black woman who has a degree in Biomedical Engineering from an Historically Black and College University (HBCU). She is currently taking a gap year to pursue religious studies and travel the world. After that gap year, she plans to pursue a graduate degree to help her create a niche where she can utilize both her knowledge of science and her passion to bring hope, equity, and innovation to poor regions.

Samantha is a Black middle-class woman, who is currently pursuing her master's in literature, Media Culture studies with an emphasis on American pop culture. As a child, her love for Star Wars and anything having to do with science fiction led to her interest in science. She plans to continue to study and write about the similarities between the culture of science and science fiction. Both Kelli and Samantha shared their stories and provided feedback during the data analysis phase and the writing phase through conversations and emails as we shared various drafts of the paper.

4.3 | Data sources and analysis

The goal of our data collection was to construct Kelli and Samantha's counterstory throughout their lifetime. Data sources included: (1) responses to open-ended questions on the pre-and post-survey camp survey questions when Kelli (2010, 2012) and Samantha (2011, 2012) participated in their respective middle school summer STEM Girls camps, (2) a life-history interview the summer after their fourth year in college (2021), (3) email exchanges where they reviewed their life histories, provided comments, and/or clarifications; and (4) email exchanges with both women during the article draft writing process where the provided feedback on the accuracy of their counterstories. This resulted in about six email conversations per author throughout 2021 and 2022. The life history interview protocol asks individuals about critical events (the highs, lows, and turning points) in their STEM trajectories, asking them to describe the people and experiences in detail to create a more vivid picture. These questions were instrumental in giving us insight into Kelli's and Samantha's counterstories of how they developed STEM identities and saw opportunities to belong despite experiencing implicit and sometimes explicit racism and sexism.

In our first level of analysis, we analyzed the open-ended survey responses from STEM Girls and the life-history interview for each participant to create a chronological storyline for each woman with detailed quotes (Creswell & Poth, 2017). We emailed Kelli and Samantha their respective storyline and asked them to correct any mistakes. We then read through these storylines using narrative coding (Clandinin & Connelly, 2000) to identify the STEM identity codes of sense of belonging (descriptions of moments where Kelli and Samantha felt like they belonged and could succeed in STEM) and recognition (descriptions of moments where Kelli and Samantha saw themselves as STEM people and others saw them as STEM people). Initially, the researcher team (first three authors) coded separately and then met to discuss discrepancies or themes. In these group conversations, we identified emergent codes (Corbin & Strauss, 2008; Esposito & Evans-Winters, 2021; Reissman, 2008; Strauss & Corbin, 1994). Table 2 provides more details on these codes and emergent subcodes: influential people and organizations, a sense of belonging, and sources of recognition.

For our second level of analysis, the first three authors examined the storylines and identity codes through the CRF lens. We coded as a group and focused on moments of uncertainty (i.e., moments where they questioned their belonging in STEM or identity as a STEM person because of their race and/or gender and its opposition to the dominant narrative of white male

patriarchy in STEM). By reviewing these moments over each woman's lifetime, we were able to create descriptions of their counterstories. During these counterstories, we identified resilience strategies Kelli and Samantha used to persevere and maintain their value and belonging in STEM, which we will present in Section 5. Once we had written our first draft of our findings section, we emailed Kelli and Samantha and asked whether we had adequately presented their counterstories. Once they had confirmed the accuracy of the resulting representation, we invited them to be co-authors because that seemed like true empowerment for their voices and advocacy for change in STEM so that future generations of Black women can thrive in STEM.

4.4 | Trustworthiness

Kelli and Samantha are coauthors of this paper. Throughout the entire process of this study, Kelli and Samantha have authored their counterstories, served as a source of member checking, and guided the writing process. In addition, we used long, rich quotes and triangulated multiple

TABLE 2 Analysis.

Emergent codes from first level analysis	Description	Connections to identity codes	Second level analysis connections to critical race feminism
Influential people	Individuals (parents, relatives, teachers, college professor) who were referenced in their STEM life history	These individuals served as sources of recognition for them, which strengthened their sense of belonging	Samantha had fewer STEM influential people in her life when she entered a PWI. Kelli attended an HBCU and had both Black women peers and role models that she could look to as a counterstory to the dominant White supremacy narrative.
Influential organizations	Organizations that provided support and a sense of empowerment for them	Within these organizations, they found peers and mentors who served as sources of recognition. They also referenced feeling like they belonged in these STEM spaces.	These organizations served as counterspaces that provided both women examples to counter the dominant White supremacy narrative of STEM (HBCU programs and STEM Girls).
Moments of identity uncertainty	These include experiences where they felt unsupported, ignored, unheard, silenced, and/or rejected	During these moments, they questioned their belonging in STEM because of a lack of recognition by others and within themselves.	Resilience strategies that they authored in their counterstory were practicing acceptance, self-compassion, and leveraging counterspaces and role models to remember their value.

sources of data, which included a life history interview, survey responses, and email correspondence to present these counterstories (Maxwell, 2005; Strauss & Corbin, 1994).

5 | FINDINGS

5.1 | Samantha: I am a STEM person, but a discounted one

At the time of this publication, Samantha was completing her first year as a graduate student in Creative Writing. She is a smart, reflective young woman whose family encouraged her STEM interests from an early age. Her parents encouraged her to apply to STEM Girls when she was 12 based on her interest in STEM in school. She was also a talented violinist from an early age and realized her love for science when she connected it to her love of the arts. When asked about her first memory of STEM, she referred to middle school when she recreated a violin showing how different frequencies interact together. She saw this moment as a high point in her early STEM trajectory because it gave her a sense of confidence and was the first time she identified as a science person. It was after the violin experience that she applied to STEM Girls. In her survey response during the camp, she explained that she was interested in science because she "wanted to understand how everything works." At that time (12 years old) she was interested in a career in psychology because she believed that field could help her to better "understand humans and how they work." Interestingly, when Samantha was 12, she described scientists as "someone in a white suit," then a year later when she attended STEM Girls a second time, she added gender to this description "a guy in a white vest with glasses."

When the first author reminded Samantha of these comments during her life history interview, Samantha explained that her stereotypical description was because she had not been exposed to Black women in STEM in her formal K-12 schooling. She explained,

> I didn't have any Black STEM teachers. The most I would read about Black people in STEM was about them being victimized (by science) in some way, whether you're talking about the biology behind Henrietta Lacks or other science experiments. So, I think that also played a part in my ability to see myself (as a scientist).

It was during her middle and high school years that she began to question her belonging in science and math because she was not presented with a counterstory of Black women as drivers of innovation to counter the dominant narrative within STEM of White male heroes often victimizing Black women.

> I think the biggest challenge I had to face was self-doubt that came in somewhere through middle school or high school with math. (As an elementary school student), I thought I was great at math. I was the best. And then it may have been the seventh or eighth grade where some kind of idea [crept in], "like okay, I'm not good at math at all" and that subtle idea (crept in)—"this class, it might not be for you." Despite no teacher explicitly telling me that, I think I internalized that mindset.

When asked to explain what she meant by an "internalized mindset," she went on to connect her feelings of uncertainty more explicitly in her STEM identity to race and gender in her high school Algebra 2 class:

> I think one thing that might've had to do with it, is the gender and racial composition of that class, and then kind of those stereotypes that come with that of, 'okay, this is what you're naturally not going to be good at'. And then doing my homework every day and taking exams and quizzes with that in the back of my head.

Here she is articulating her sense of not belonging in math because of racist and sexist stereotypes portraying White men as good at math. She references how these dominant narratives were in the back of her head as she continued through her coursework, leading to her self-doubt.

This nagging feeling of not belonging because she was surrounded by mainly White men and women continued into college at her chosen Predominantly White Institution (PWI). Samantha entered college as an undeclared science major with an interest in astrophysics. In her first year of college, she described her chemistry course as being the final experience that drove her to consider leaving STEM altogether. She was the only Black woman in this college chemistry class.

> I remember actually being good at chemistry in middle school and high school, but I remember there was something (in college), the information wasn't always clicking to me. So, it made me rethink a lot of things like, "do I really know myself?"

Here Samantha was questioning her own identity as a science person or someone who is "good at" science. She began to deconstruct her counterstory of being good at chemistry in middle and high school and succumbed to the dominant narrative in STEM.

When asked why she thought chemistry was hard for her in college, Samantha expressed frustration with the way the professor taught, "he was very cold and impersonal" and the contradiction between his espoused goals for science and her own:

> I (believed that the goal of science) was ultimately to help people, help the environment, help every living thing. And I wasn't feeling that in that particular (class), just due to his demeanor, his disposition.

Samantha had a core identity of wanting to understand how humans and the world worked—as evidenced by her middle school STEM Girls survey response. And here she articulates her view that science should help people, but the faculty member—her only role model in chemistry—made her question whether science could be altruistic. Although Samantha did pass this class with a B, she saw this as evidence that she did not belong.

Because of the timing of our interview with Samantha (her senior year of college), she had had time to reflect on the reasons for her sense of not belonging, which was connected to the dominant narrative of sexism and racism in STEM.

> Most of the successful students (in my chemistry class) tended to be White (and) male. I was looking at the people around me, and thinking, "How am I going to make it out?" Like at the end of class, we'd all be looking at the test results and I was thinking, "If this is difficult for them, then what odds do I have at the end of the day with this exam?"

When asked to explain this self-doubt, Samantha articulated how science is rooted in sexism and racism making her feel like she couldn't succeed:

> It has to do with preconceived notions that we have with science and that when you think of a scientist, you're usually thinking of a man in a white lab coat... And that wasn't who I was. And I think also society tells us what we're good at and what we're not good at. So, there was no one telling me (in school), "You could be really good at science or math or technology." So, I didn't have that confidence and I didn't see myself always reflected in science or among scientists in general.

Samantha's counterstory of belonging in STEM could have been completely dismantled by the dominant narrative in STEM but in the next section, we show how she further developed her counterstory and saw herself articulating who she was about science.

5.2 | Counterstory: Inspiring future STEM people through science fiction

Samantha's experiences in two counterspaces in middle and high school gave her a resilient counterstory. These two counterspaces were an astrophysics program held at a nearby HBCU that she attended with her father and STEM Girls. Samantha referenced the astrophysics program as an influential experience that contributed to her interest in astrophysics seeing it as "approachable" and "very interesting." She was not only excited about the astrophysics part, but she also felt empowered to succeed in STEM because she was learning about astrophysics in a space with all African-American students.

> I felt surrounded by people who were doing the same exact thing. They look like me. I look like the professor; we have something in common and he's made it here. So maybe I also have that chance to do that as well.

Similarly, STEM Girls served as a counterspace for her.

> I was able to see myself represented in a way that I still haven't been able to, even now as an adult, in that I was not only surrounded with girls my exact same age doing the same thing, working towards a goal. But also, the people that were teaching us were women. That was very powerful.

These collaborative efforts helped her not only see other girls, like Kelli, as a source of motivation but also to strengthen friendships.

> I was just so empowered watching Kelli in STEM Girls because she was so motivated and so passionate about what she was doing, that it just rubbed off on me because I'm seeing myself represented in someone else which empowered me. So, I think that's also helped me kind of see myself as technically STEM.

Samantha talks about these two informal STEM education counterspaces because these were the only times in her memory that she was surrounded by supportive people who looked

like her. It is also important to point out how she makes a clarifying statement that she sees herself as "technically STEM" at the time of the interview when she was beginning her first year of graduate school with an interest in science fiction creative writing.

Her value judgment of being a writer compared to being a STEM person comes through in her story of switching majors. Samantha described the semester she took chemistry as the low point in her STEM trajectory because it called into question her lifelong interest in STEM. Samantha was ready to leave STEM altogether because of her experience in her chemistry course, the lack of role models in her college STEM classes, and inadequate career counseling, which added to her sense of isolation in STEM. She remembered her love of writing and science fiction during her first literature class after the chemistry semester.

> In my literature class, we were discussing how science is portrayed. And I was thinking, okay, this might actually be something that I really like, and I was writing to my heart's content. I was just having so much fun applying science. And I've always loved science fiction. And by the end of that semester, I was an English literature major.

Here Samantha was able to author her counterstory by connecting her love of writing and science even at a point where she was having so much uncertainty surrounding her STEM identity. She began adding more details from her past to her counterstory to strengthen her sense of being a STEM person.

> I am the biggest Star Wars fan ever. And the thing I was always fascinated with was how to do these things that don't exist in our world. How can you make them exist? And that was something that I've always been attracted to. And I had never fully made that connection with science until my English literature class and the Star Wars documentary I watched during that semester. I had passed chemistry somehow, but I was thinking, what am I going to do with the rest of my life? I remember watching the documentary and thinking this science is amazing and it doesn't exist in our world, but it can exist in a literary science fiction realm. Just because something isn't strictly STEM does not mean that you can't apply science to it. And science is influenced by the arts. We separate the two fields saying they have nothing to do with one another when they absolutely do influence each other. And that's when I thought this is actually what I would love to do.

Here, we see how Samantha constructed her counterstory of being a STEM person by connecting her interest in science, her desire to understand how things work, and her love of writing to create a new STEM identity. When asked if she still saw herself as a STEM person, she explained:

> I would have to say yes. Oddly enough, even though literature seems to be almost the exact opposite (of STEM), I've always been interested in how the real world interacts with literature, and how they influence each other. (As a literature major) I'm analyzing a piece of literature and the science behind it. I'm going to have to look at real-life science and then be able to understand what certain things mean. To a certain extent, I feel like I'm a discount STEM major—without the degree.

Here, we see her put a value judgment—discount—on her newly authored STEM identity. She was able to create a counterstory of herself as a STEM person, but she still internalized the norms of STEM, which caused her to call herself a discount STEM major. We see how Samantha saw the value of writing and the arts to science and yet she still felt the dominant narrative of STEM as something more valuable than the arts. Although Samantha enjoyed her chosen major and career plans and had developed a counterstory, she still could not see herself as the stereotypical STEM person not only because of her major but also because of her sense that Black women were not part of STEM.

However, Samantha may end up writing stories that inspire and empower Black girls and change the narrative of Black women that she had seen in her life (i.e., as victims of STEM). She could help other young Black girls see STEM identities for themselves, like science fiction author Octavia Butler. Perhaps Samantha is already finding her voice, as she so beautifully expressed her vision of the culture of care that STEM can aspire to when asked about what she sees in her future. We will close this section with those words:

> I would love to write or analyze science fiction one day. I think one thing that opens new possibilities for science is this idea of STEM being used as a tool for care, rather than just a tool for analysis. I think a lot of the time when we interact with STEM, we're analyzing something, discovering something, which is very important. But I think it's also good to bring home that care element. How are we caring for the earth? How are we caring for the animals? How are we caring for the people around us? And that would be my ideal future: we, everyone, could approach STEM in a more caring way, rather than that cold analytical stereotype.

5.3 | Kelli: Remembering her values to create a STEM identity

At the time of this publication, Kelli had recently graduated with her Bachelor of Science degree in biomedical engineering from an HBCU in the southeast. She is a smart, funny, and reflective person. Like Samantha, her family supported her in her STEM interests from an early age. She has known Samantha since they were both in kindergarten. Kelli explained how she has been interested in science since was 6 years old. Her first science memory was receiving a toy "doctor's bag" as a gift from her parents. Her interest in medicine was driven by her desire to "help people" and was also articulated in her first STEM Girls survey. In her second year of STEM Girls, when asked what career she was interested in she said that she "would like to either be a surgeon or an engineer because I would be helping society while doing something that I love." This goal of altruism would come up multiple times in Kelli's STEM counterstory. Unlike Samantha, Kelli did not reference gender in her description of a scientist on either of her STEM Girls surveys. Across both camp surveys, Kelli consistently referred to scientists as "smart and creative people who enjoy science and want to make a difference in the world." This view of scientists mirrored her view of herself.

Like Samantha, Kelli highlighted the value of STEM Girls because she was able to work with other girls and create a sense of community as well as a positive and impactful learning experience:

> I think (STEM Girls) was actually my first introduction to diversity and inclusion, in a different way (from college), because now every time I'm introduced to

> diversity and inclusion, it's very like Black... in STEM Girls this idea that there was a place and space for females in STEM. I think there's some subconscious biases and maybe even prejudices that females can develop over time.

Kelli references the dominant narrative of STEM when she mentions the "subconscious biases" that prejudice women in STEM. Kelli credits STEM Girls with giving her confidence during later moments of self-doubt in middle and high school classes.

> For me STEM Girls definitely helped my trajectory in terms of feeling more confident in STEM, especially going through middle and high school. Because when I first started taking Algebra and all these math classes, it wasn't going easy at first.

Despite referencing these courses as not "going easy at first," Kelli had a high GPA in high school, explaining, "STEM was never a hard thing for me." Although Kelli did not have any Black women or men teachers in K12, she felt like she was a strong STEM student during this time. She also participated in a STEM high school internship at an HBCU where she worked with another young woman who had been in STEM Girls with her, referring to the experience as "STEM Girls going strong!"

Kelli chose to go to an HBCU. When asked how she made this decision, she references the dominant racist narrative that led to internalized oppression:

> Before I got to the HBCU, I had a bad problem with looking down on other Black people because in my high school, maybe sophomore or junior year, I was already starting to get into AP classes. And in those classes, there were only like one or two other Black people. So, I was like "The Black people who are in the (AP) class are my equal and the other Black people who aren't in my class are not my equal."

Kelli had internalized the cultural stereotypes related to Black students' academic abilities. Yet, she knew she wanted to go to an HBCU to engage in more cultural experiences. It was not until her organic chemistry class that she realized she even held stereotypes against Black students.

> So, there was like this subconscious bias that was being built up in me that I didn't realize until literally my first day of organic chemistry (at my HBCU). (We had) a Black woman (teacher), and she's the best at explaining chemistry. I remember I was in class, and someone said something about the order of operations in math—PEMDAS. So, I like yelled out the PEMDAS. And I just started laughing because it was like, the first time in forever, that I wasn't holding my breath. Like I can be who I am and express myself the way that I naturally am. And I didn't feel like I was trying to act like I'm some different way.

Kelli's class served as a counterspace where she could begin to be herself and develop her counterstory narrative as a smart STEM person who was not alone.

> Just hearing other Black people, I was in a class with maybe a hundred other Black people who were all, in this higher level chemistry class with me and looking around and seeing literally all of them like getting it, killing it, doing study groups,

> seeing some of them be way better at it than me and seeing some of them be a little bit worse at it than me, but like there was just this comradery, it was just really beautiful.

The counterspace of the HBCU and this class helped Kelli to disrupt the White supremacist oppressive narrative of both American society and STEM. She goes on to explain:

> I just remember that moment. I was just like, "This is the true narrative of my people." I will never ever forget that day, because I think a lot of people try to convince Black people that you can't resonate with anything of your culture and move higher up—from your hair, from how you wear your hair to how you may talk. You can't wear like bigger earrings. You can't do your hair a certain way. You can't do this and that. I used to straighten my hair all the time and now I don't straighten it at all. I was really like told by my hairdresser one time 'They won't accept you unless your hair is straightened'. And I've been raised with this idea that my biggest goal in life should be to actually make White people as comfortable as possible by changing how I look to resonate more with them. I think being at HBCU taught me that there is Black professionalism. And even within that, it's not Black professionalism. It's just straight professionalism. The HBCU opened up this idea that Black people can be professional and still be your natural, authentic Black selves. So, I was like, this is absolutely beautiful.

By attending an HBCU, Kelli was able to see Black people demonstrating their excellence in ways that were authentic to them. She was able to embrace and see the beauty in her Blackness and connect this to STEM excellence as she was surrounded by other Black students excelling in STEM.

> I've been fed the narrative that Black people just aren't smart. That we aren't the ones who know math and science. We're the ones who can be really good at sports. We're really good at entertaining. But we are not the ones who end up being [the next] Elon Musk or Steve Jobs. Like Black people are here for entertainment. You are not here to actually make a difference.

Here she articulates the dominant narrative of American society, which could be a moment of self-doubt. But she was able to develop a counterstory of resilience in response to this.

> I think constantly having to fight that (narrative/stereotype) that I've been fed whenever I face a wall in my science and math classes, that I'm not here for entertainment. I'm not your show. I'm a human being. I'm here to learn and yes, I may fail and yes, I may make more mistakes than you, but the reason I make more mistakes than you has nothing to do with my skin tone. If anything, it has more to do with the fact that you may have been more privileged in your upbringing than I was or the fact that you have more access to tutors and all these other things than I may not have access to.

Kelli notably changes the subject to herself ("I") in this second quote, authoring her counterstory in real-time. She demonstrates a sense of agency and acceptance related to the attitudes

that she cannot change and her sense of belonging in STEM despite the dominant narrative in STEM and society. Kelli had not fully realized until she was at the HBCU, her frustration with society and how these power structures made her feel like she had "to change herself to make White people comfortable."

Kelli described more sources of external recognition in her narrative than Samantha, including two mentors—professors at her HBCU—who are both African American women. Her first mentor was Dr V, an African American woman engineering professor. As an engineering major, Kelli joined a program within the College of Engineering that created a cohort of African American and Black students who participated in professional development, tutoring, and lab tours—another counterspace. The lead faculty member for this program was Dr V. Kelli specifically named Dr V as influential in reorienting her viewpoint of Black women in positions of authority and pushing her to see herself in a STEM career, a counterstory to the sexist and racist narrative in STEM:

> (When) I first met Dr. V, she came into the room, and I thought—"Who is this woman?" With all the respect that she demands by walking into a room. I was just amazed. I was like "I want to be like you," like, in terms of, being an African American woman, I want to walk with a certain amount of confidence and elegance, but also just knowing who you are...it's just like a certain air of fearlessness that Dr V. has. Being able to meet someone like her definitely has helped me moving forward in terms of future career goals.

Her mentoring relationship with Dr V allowed her to develop aspirations in STEM and see herself as belonging by meeting another successful Black woman. Dr V served as an important character in her counterstory, helping her gain the confidence to demand respect while still being her authentic self. Kelli's use of the word "fearlessness" highlights the difficulty (i.e., fear) that Black women might feel in White and male-dominated spaces like engineering.

Kelli's second mentor was Dr R, a Black woman who has a PhD in chemical engineering and works on a national level on diversity and inclusion efforts. Dr R's experience allowed her to be "blatantly honest" with Kelli and share her experiences of encountering racism and sexism in engineering. Kelli explained that she was thankful for this advice so that she would "not be this rosy-eyed person who thinks that I'm going to go into these places and spaces and be treated fairly." Dr R prepared Kelli not just with engineering skills but the realization that she would face discrimination. This knowledge and her mentors gave her the armor she would need to enter STEM spaces and remain confident. Consequently, the counterspaces of STEM Girls and her experiences at her HBCU added to her counterstory, which she could revisit to remind herself of her love for science and that she belonged in STEM.

5.4 | Counterstory: Connecting altruism to engineering

Kelli, like Samantha, encountered moments of self-doubt where she became uncertain of her STEM identity. As an engineering major, Kelli's low point in her STEM counterstory was when she failed Calculus 2 in college. Not passing the class for Kelli was "a rude awakening" and led her to question whether she belonged in her major. Because she was in a predominantly Black space, she did not question her race, but she did question her sense of belonging based on her gender.

> Because at that point my main group of friends were actually (Black) males and they had all passed. And so, in that moment, I was questioning, "Is it because I'm a female that I'm doing worse with this"?

She goes on to describe the dominant masculine narrative in STEM as adding to her doubt.

> Because that's what everybody tells you. Or that's like the feeling you get. There's a lot of microaggressions that got me thinking that I was inadequate, thinking like, "You're not going to do well; you're never going to graduate."

For a moment, Kelli succumbed to the cultural sexist oppression that women cannot be successful in STEM. Kelli credited her Christian faith as helping her persevere. After failing the Calculus 2 class she described "breaking down and crying at a church service." It was at that service that she was able to provide herself with compassion. Through this self-compassion and self-reflection, she realized what types of teaching practices helped her learn best and that there were improvements she could make to her study habits. Kelli was able to talk to peers and mentors about these setbacks and get a perspective that helped her continue to see herself in STEM.

Despite the support Kelli had, she did wonder about her career options in engineering and how they matched with her personal goals.

> I used to really want to be a doctor. As you may remember. Actually, I wanted to be a surgeon, and I have nothing against surgeons. It's just me and blood, we still don't agree. And recently, I saw a post on Facebook. My cousin made a post that said African American women shouldn't have to choose between whether they want to live or whether they want to give birth. And I was like, "What? That's a thing?" So, I went on a deep dive, I was researching all these things. And then I realized that this was a true issue, that the mortality rate of African American women, when they give birth is ridiculously high.

Kelli's realization of how systemic racism and sexism continue to affect Black women led her to seek out family members who worked with pregnant Black women and mothers. It was after this conversation that she began to see the next steps toward a career that connected her altruistic goals with her STEM identity, considering pursuing Public Health and working in maternal health. Through her counterstory, she was able to find motivation and resilience in her major by finding personally meaningful connections (i.e., altruism and helping others) between her engineering identity and her racial and gender identities. Kelli's network of role models, mentors, and peers helped her develop a counterstory that helped her to remain resilient despite knowing the racial and gendered discrimination she would face in her chosen field.

6 | DISCUSSION

Our combined lens of CRF (Esposito & Evans-Winters, 2010; Miles et al., 2022) and STEM identity (Hazari et al., 2020; Kim et al., 2018) helped us to structure Kelli and Samantha's counterstories of being and becoming STEM people (Ibourk et al., 2022; Leyva, 2016, 2021) in a world where STEM is defined by the dominant discourse of Whiteness and sexism through their participation in various counterspaces (McGee, 2020; Wright & Riley, 2021). By including Kelli and

Samantha as co-authors on this paper and empowering their authoring of their counterstories, we saw how they developed their STEM identities (Carlone & Johnson, 2007; Kim et al., 2018) and defined who they were and are within STEM despite the current White supremacist and sexist dominant narrative (Evans-Winters & Esposito, 2010). Below, we will highlight how both women relied on their experiences in counterspaces to differing degrees, which became strong STEM identity memories for them as they folded those memories into their counterstories (Evans-Winters & Esposito, 2010; Leyva, 2016, 2021). Although both women developed resilience due to their counterstories, both of our co-authors' experiences show that resilience is not enough to improve the representation of Black women in STEM due to the dominant discourses of Whiteness and masculinity within STEM as we highlight below.

6.1 | Counterspaces

Both women referenced the positive influence and benefits of counterspaces to their sense of belonging (e.g., STEM Girls, HBCU programs) (Nasir, 2012; Solórzano et al., 2000; Solórzano & Yosso, 2002). Similar to Nicole Joseph's work (Joseph et al., 2017, 2019), we found that Kelli and Samantha's memories of and experiences within counterspaces helped them to develop resilience strategies in response to the politics of recognition that influenced their experiences in STEM as Black girls and women (Avraamidou, 2020, 2022; Ibourk et al., 2022; Johnson, 2020; Rahm et al., 2021; Smith et al., 2019; Wade-Jaimes et al., 2021; Wade-Jaimes & Schwartz, 2018). As a reminder, Joseph and her colleagues defined counterspaces as having three main components: (1) structural disruptions, permanent as well as short-lived opportunities or experiences, such as culturally responsive educators and mentors, (2) community influences, the network created within counterspaces where Black girls can come together to affirm and strengthen their identities as STEM people and solidify their sense of belonging in STEM; and finally (3) resilience strategies that include stereotype management and counterstories (McGee, 2013). For Kelli and Samantha, during middle school and high school, STEM Girls and their respective HBCU experiences served as structural disruptions to the dominant narrative. Both women referred to STEM Girls as a space where they felt empowered as women in STEM and met supportive mentors and educators, which served as a strong memory and source of resilience for each of them later when they encountered moments of doubt related to their ability to succeed in their high school math classes (Joseph et al., 2017). Although STEM Girls is not focused on race and therefore does not fit the Solórzano definition of a counterspace (Solórzano et al., 2000; Solórzano & Yosso, 2002), Kelli and Samantha referenced the community influence of STEM Girls that strengthened their connections to STEM through the friendships and network they developed with other young women and the confidence they gained in their belonging and development of resilience strategies. These experiences served as disruptions to the dominant discourse of masculinity in STEM, which makes it more difficult for women to be and to feel recognized as STEM people (Tan et al., 2013). STEM Girls was a bright but still, a very White spot for both women in their K-12 journeys where they never encountered Black women STEM teachers and role models.

Because both women had no Black women STEM role models during their K-12 experiences, it was easier for them to succumb to the dominant narrative of racism and sexism in college as Black women in college STEM majors (McGee, 2020; Morton & Parson, 2018; Smith et al., 2019). Kelli attended an HBCU that served as a counterspace to the dominant discourse of Whiteness and masculinity in STEM. Her experiences at her HBCU allowed her to frame her STEM identity in a space where she could readily witness the variety and empowerment of

Black excellence in STEM. Although Samantha did not attend an HBCU for college, she did reference a racial counterspace—the astronomy program at the HBCU she participated in with her father. This program supported her sense of Black folks not only being interested in astronomy but also adding to research in this field. However, Samantha had fewer Black women role models and less support in her STEM endeavors as she moved through high school and college. As a result, when Samantha felt like she was not understanding concepts quickly in college chemistry and did not see any other Black women in her classes or the STEM department (i.e., being confronted with the politics of recognition), she doubted her identity as a STEM person. Samantha did not have any experiences in college to counter the dominant narrative and no one explicitly told her she belonged, leading to her decision to leave her science major.

Kelli conversely had multiple structural disruptions and community influences through her enrollment in an HBCU (i.e., counterspace) (Joseph et al., 2017; McGee, 2020). She referenced the support she had from Black women educators and mentors (i.e., structural disruptions), and the community influence of her Black classmates, recognizing the collaboration and camaraderie that contributed to the success of all students (Gasman & Nguyen, 2019). Through her experience at her HBCU, she confronted her stereotypes related to Black folks being competent in STEM. She spoke about the moment when she was surrounded by Black students discussing STEM concepts and how empowering that was for her to not only confront her stereotypes that were affected by the dominant discourse of Whiteness in STEM but to see a new vision of and politics of recognition within STEM that included Black people as creators in STEM, which helped in her development of resilience strategies. In addition, she was part of an engineering program led by a Black woman (Dr V) who had succeeded in engineering and served as a structural disruption to the dominant narrative. Kelli was inspired by Dr V's fearlessness, confidence, and elegance. Her experiences in these programs helped her strengthen her resilience by giving her a stronger sense of her value as a Black woman in engineering, which helped her navigate moments of self-doubt (McGee, 2013; McGee & Martin, 2011).

Although Kelli attended an HBCU, these spaces are not free of power differentials. HBCUs are still part of a nation and higher education system that is infiltrated by racism (McGee, 2020). However, race and racism were explicitly discussed in Kelli's classes at her HBCU, giving her tools to develop resilience and see her value (Ibourk et al., 2022). This was different from Samantha's experience at her PWI. Although we did not interview faculty at the PWI that Samantha attended, Gasman and Nguyen (2019) highlight how PWI faculty in general assume a deficit model for their students of color. As Samantha moved through her PWI experience, she questioned her belonging not because anyone told her she did not belong as a Black woman but because she did not see any other Black women succeeding. She implicitly felt "the social, political, and educational systems that continue to abuse and neglect (Black women's) bodies and minds" (McGee, 2020, p. 635).

6.2 | Counterstories

Kelli and Samantha both encountered setbacks in their STEM trajectories due to broader structural systems of who belongs in STEM and the politics of recognition (Carter Andrews et al., 2019; Collins & Bilge, 2016; Gholson & Martin, 2014; Joseph et al., 2017; King & Pringle, 2019; Ladson-Billings, 2009b; Nasir, 2012; Ridgeway & McGee, 2018; Wright & Riley, 2021). However, the counterspaces they participated in served as strong reminders and memories to counter the dominant narratives of Whiteness and masculinity in STEM (Joseph

et al., 2019; McGee, 2020). These counterspaces reminded them that they were not alone as Black women and became part of their counterstories of resilience by helping them return to positive memories of empowerment through influential mentors, community networks, and resilience strategies. Both women felt strongly that they wanted to help others and society. These goals often conflicted with how science was portrayed both in their STEM classes but also in society more broadly. However, they were both able to author a counterstory that empowered them to see themselves as belonging. Their imagined STEM futures changed their perspective not only of who belongs but also of who is needed in STEM to make it a more inclusive and just space for others to thrive. This is an incredible feat—imagining a future STEM that is so dramatically different from the current inherent White and masculine system and moves this vision beyond the deficit model that forces Black women to use resilience coping mechanisms to barely survive in STEM (Leyva, 2021; Morton & Nkrumah, 2021; Rosa & Mensah, 2021; Wright & Riley, 2021). However, the level of belonging was different for them, as represented below and in Table 3, which compares their counterstories of resilience with counterspaces bolded.

Samantha's counterstory articulates her radical future vision of STEM that shifts from a colorblind and competitive space to one that engages a culture of care for all beings. This imagined STEM future is so difficult for most of us who are entrenched in the dominant narrative to even picture. Through her counterstory, we see that she did see herself as a STEM person, but she often used terms that demonstrated her sense that she was not a full member of the STEM enterprise due to her choice of writing as a career (e.g., discount STEM person). Samantha was able to author her counterstory by connecting her love of writing and science even at a point where she was having so much uncertainty surrounding her STEM identity. We see how Samantha saw the value of writing and the arts to science and yet she still felt the dominant narrative of STEM as something more valuable than the arts. For Samantha, we see her use of resilience strategies to create a space for herself on the periphery of STEM, but these were not enough for her to see herself as a full and authentic member of STEM.

Like Samantha, Kelli had to create a new vision of engineering to see herself as an engineer. Through her story, you can see how she became more motivated in her engineering pursuits when she saw ways to connect her identity as a Black woman committed to equity to her major. Once she saw a potential career that could make Black maternal health more equitable, she began to solidify her sense of belonging and identity as a STEM person. Both women see altruism as important to their own identities and created a space for themselves in STEM. And yet, these imagined STEM spaces that include a culture of care are not a reality, highlighting the current constraints of Whiteness and masculinity inherent to STEM (McGee, 2020; Wright & Riley, 2021). This begs the question of whether the resilience strategies of redefining STEM with a culture of care lens will be enough to sustain these two women as they continue in their chosen STEM trajectories.

Our goal for this study was to determine how Kelli's and Samantha's counterstories shaped their STEM identities and resilience within STEM. Through this act of counterstorytelling, this study is addressing the call for researchers to move beyond the deficit model often seen in research on Black women in STEM (Morton & Nkrumah, 2021; Rosa & Mensah, 2021). In addition, it allowed us to imagine a STEM enterprise that includes a culture of care, which is currently missing in STEM (Crenshaw et al., 1995; Ladson-Billings, 2009a, 2009b; McGee, 2020). And yet, we are left with the question, is resilience enough? Kelli's and Samantha's counterstories could not completely shield them from the doubts related to their belonging and success in STEM due to the dominant narrative of STEM. Samantha even discounted her value within STEM.

TABLE 3 Counterstories of resilience at each educational level.

Educational level	Kelli	Samantha
Counterstories of resilience from elementary school and before	Receiving encouragement from her family (her first science memory was receiving a toy "doctor's bag" as a gift as a child from her parents; her family enrolled her in science camps).	Receiving encouragement from her family for her pursuit of science (her family attended her presentation that connected her love of music and science).
Counterstories of resilience from middle school/ high school	**STEM Girls** served as a source of empowerment reminding her that she belonged and could succeed in STEM because she saw other girls doing STEM. **Internship at HBCU** with a Black STEM Girl alumni showed her examples of other Black women succeeding.	**STEM Girls** served as a source of empowerment because she saw her gender represented in STEM. collaboration with friends. **HBCU Science Fiction program** served as a strong memory for her to connect her love of science fiction to not only science but her race.
Counterstories of resilience from college	She was able to see engineering to help people. Her **HBCU classes and programs** served as a counterspace that disrupted her own internalized oppression. Her self-compassion developed through her Christian faith helped to develop her agency and acceptance of the dominant narratives that she could not change. Black women mentors showed her it was possible to be yourself and a STEM person.	Entered college interested in astrophysics, but her experience with the narrative of a cold and inhumane view of science in her chemistry class made her consider leaving STEM. She created a version of STEM (i.e., science fiction writing) that allowed her to see herself as a "discounted" STEM person.
The dominant story still creeps in	Despite being at an HBCU, the lack of women in her STEM classes made her question if she could be successful (sexism)	Her use of the term "discounted" shows that she still does not see herself as a true STEM person. Despite earning a B in her chemistry class, she felt like she couldn't be successful because she was the only Black woman and had no role models to show her a counterstory to the STEM narrative (Racism and sexism) Despite loving her chosen interest of science fiction, she had internalized the dominant narrative that the arts were lesser than science

7 | LIMITATIONS AND IMPLICATIONS

This study provides an in-depth understanding of Samantha and Kelli's experiences, and we believe that it amplifies the important message of having the diverse voices of Black women heard and their counterstories told (Leyva, 2016, 2021; McGee, 2020). Counterstorytelling in

STEM education can help researchers better understand the experiences of Black women and girls of color whose voices are missing in STEM. Their experiences at an HBCU and a PWI are unique. Because we were focused on the counterstories of Kelli and Samantha, we were not able to explore the cultures at their respective HBCU and PWI. A more in-depth study of how the institutional, departmental, and disciplinary cultures inform Black women's STEM counterstories would be beneficial to the field.

Our study, like Nasir (2012) as well as Joseph et al. (2019), demonstrates the importance of counterspaces (structural disruptions, community influences, and resilience strategies) to help Black women and girls learn how to resist racial and gendered storylines and create positive STEM identities even if they are still constrained by the dominant systems of oppression. Both Samantha and Kelli referenced informal education spaces such as STEM Girls and programs at HBCUs as safe environments, which ultimately served as structural disruptions where both women were able to develop a sense of community and belonging through their experiences. Counterspaces like summer science camps and afterschool programs are crucial tools in helping Black girls develop counterstories that demonstrate their value to STEM (King & Pringle, 2019). Although work exists that looks at ways that programs and educators can empower girls (Lock & Hazari, 2016), more research is needed to investigate how programs and educators can specifically empower Black girls since (due to STEM's inherently Whiteness) interventions focused on gender alone without an intersectional lens will result in benefits for girls in the majority.

Another important finding from our study is the positive influence of not just HBCUs but specific programs within these counterspaces led by role models that help Black women see their value in STEM. Kelli developed her counterstories of resilience through her participation in a special program within the College of Engineering at her HBCU. She credited the collaboration and support from her peers but also the motivation that two Black women role models provided, illustrating that support structures need to be further developed and cultivated for Black women (including counterspaces at PWIs) (Gasman & Nguyen, 2019; McGee, 2013, 2020; McGee & Martin, 2011; Morton & Nkrumah, 2021; Wright & Riley, 2021). More research needs to be done to determine how PWIs can support their students of color and learn from HBCUs.

8 | CONCLUSION

Samantha internalized the dominant discourse of STEM and saw her choice to become a science fiction writer as lesser to a "real" STEM career choice, and no one reached out to her during her moments of self-doubt to say she belonged. Like many other Black women, she was neglected in a system that relies on colorblindness and an assumed egalitarianism that prevents socializers from purposely developing strategies and programs that empower students of color to see themselves as not just tolerated but valued members of STEM (McGee, 2020). And yet, Samantha was able to imagine a future—a radical awakening of STEM—where STEM is based on a culture of care. Part of this awakening is a process of truth and reconciliation by the retelling of counterstories of oppression. The authoring of their counterstories offered a space for both Samantha and Kelli to witness, retell, and record their counterstories, and more importantly, disrupt the systems of oppression to create a vision of STEM that is based on a culture of care. And yet, even the lens we use to study Black women centers the dominant discourse of Whiteness and masculinity by focusing on "counter" spaces and stories rather than simply stories.

Persisting in the current STEM culture is resulting in Black women's physical and mental exhaustion (McGee, 2020). Sadly, the imagined STEM futures that Kelli and Samantha aspire to create can currently only be imagined with few real examples, but it does highlight the value of their voices. This sense of imagined futures highlights the importance of science fiction writers and their immense power to not only inspire scientists and engineers but to inspire individuals to disrupt systems of oppression as shown by Octavia Butler's immense influence in science fiction and Afrofuturism (Morton et al., 2019). Let us all work toward this future so that Black women (and others marginalized by the dominant discourse) are no longer relying on coping resilience strategies. If we do not work toward this future, resilience alone will not be enough.

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ORCID

Roxanne Hughes https://orcid.org/0000-0002-6383-1341
Amal Ibourk https://orcid.org/0000-0001-9019-5208

REFERENCES

Avraamidou, L. (2020). Science identity as a landscape of becoming: Rethinking recognition and emotions through an intersectional lens. *Cultural Studies of Science Education*, *15*, 323–345. https://doi.org/10.1007/s11422-019-09954-7

Avraamidou, L. (2022). Identities in/out of physics and the politics of recognition. *Journal of Research in Science Teaching*, *59*(1), 58–94. https://doi.org/10.1002/tea.21721

Calabrese Barton, A., Kang, H., Tan, E., O'Neill, T. B., Bautista-Guerra, J., & Brecklin, C. (2013). Crafting a future in science: Tracing middle school girls' identity work over time and space. *American Educational Research Journal*, *50*(1), 37–75. https://doi.org/10.3102/0002831212458142

Carlone, H. B., & Johnson, A. (2007). Understanding the science experiences of successful women of color: Science identity as an analytic lens. *Journal of Research in Science Teaching*, *44*(8), 1187–1218. https://doi.org/10.1002/tea.20237

Carter Andrews, D. J., Brown, T., Castro, E., & Id-Deen, E. (2019). The impossibility of being "perfect and white": Black girls' racialized and gendered schooling experiences. *American Educational Research Journal*, *56*(6), 2531–2572. https://doi.org/10.3102/0002831219849392

Chambers, D. (1983). Stereotypic images of the scientist: The draw-A-scientist test. *Science Education*, *67*(2), 255–265. https://doi.org/10.1002/sce.3730670213

Clandinin, D. J., & Connelly, F. M. (2000). *Narrative inquiry: Experience and story in qualitative research*. Jossey-Bass.

Collins, P. H., & Bilge, S. (2016). *Intersectionality*. Polity Press.

Corbin, J. M., & Strauss, A. L. (2008). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (3rd ed.). SAGE.

Crenshaw, K., Gotanda, N., Peller, G., & Thomas, K. (Eds.). (1995). *Critical race theory: The key writings that formed the movement*. The New Press.

Creswell, J., & Poth, C. (2017). *Qualitative inquiry and research design: Choosing among five approaches*. Sage.

Esposito, J., & Evans-Winters, V. (2021). *Introduction to intersectional qualitative research*. SAGE.

Evans-Winters, V. E., & Esposito, J. (2010). Other people's daughters: Critical race feminism and Black girls' education. *Educational Foundations*, *24*, 11–24.

Farinde, A. A., & Lewis, C. W. (2012). The underrepresentation of African American female students in STEM fields: Implications for classroom teachers. *US-China Education Review*, *2*(4), 421–430. https://doi.org/10.1163/9789004405400_003

Ferguson, D., & Martin-Dunlop, C. (2021). Uncovering stories of resilience among successful African American women in STEM. *Cultural Studies of Science Education*, *16*, 461–484. https://doi.org/10.1007/s11422-020-10006-8

Ferguson, S. L., & Lezotte, S. M. (2020). Exploring the state of science stereotypes: Systematic review and meta-analysis of the draw-A-scientist checklist. *School Science and Mathematics*, *120*(1), 55–65. https://doi.org/10.1111/ssm.12382

Gasman, M., & Nguyen, T. H. (2019). *Making Black scientists: A call to action*. Harvard University Press.

Gholson, M., & Martin, D. B. (2014). Smart girls, Black girls, mean girls, and bullies: At the intersection of identities and the mediating role of young girls' social network in mathematical communities of practice. *Journal of Education*, *194*(1), 19–33.

Gholson, M. L., & Martin, D. B. (2019). Blackgirl face: Racialized and gendered performativity in mathematical concepts. *ZDM: the International Journal on Mathematics Education*, *51*, 391–404. https://doi.org/10.1007/s11858-019-01051-x

Gonsalves, A. J. (2020). Operationalizing intersectionality to investigate the role of recognition in the landscape of becoming. *Cultural Studies of Science Education*, *15*, 347–357. https://doi.org/10.1007/s11422-019-09964-5

Hancock, A. M. (2016). *Intersectionality: An intellectual history*. Oxford University Press.

Hayes, A., Matthews, Y., Linden, R., Wilson, M., Huang, X., Johnson, A., McAlister, B., Seifert, R., Liss, S., & Burkhardt, N. (2020). First results from the dark skies, bright kids astronomy club draw-a-scientist test. *Physical Review Physics Education Research*, *16*(1), 010131. https://doi.org/10.1103/PhysRevPhysEducRes.16.010131

Hazari, Z., Chari, D., Potvin, G., & Brewe, E. (2020). The context dependence of physics identity: Examining the role of performance/competence, recognition, interest, and sense of belonging for lower and upper female physics undergraduates. *Journal of Research in Science Teaching*, *57*(10), 1583–1607. https://doi.org/10.1002/tea.21644

Ibourk, A., Hughes, R., & Mathis, C. (2022). "It is what it is": Using storied-identity and intersectionality lenses to understand what shaped the trajectory of a young Black woman's science and math identities. *Journal of Research in Science Teaching*, *59*(7), 1099–1133. https://doi.org/10.1002/tea.21753

Ingold, T. (2011). *Being alive*. Routledge.

Johnson, A. (2020). An intersectional physics identity framework for studying physics settings. In A. J. Gonsalves & A. T. Danielsson (Eds.), *Physics education and gender: Identity as an analytic lens for research* (pp. 53–80). Springer. https://doi.org/10.1007/978-3-030-41933-2_4

Johnson, A. C., Brown, J., Carlone, H., & Cuevas, A. K. (2011). Authoring identity amidst the treacherous terrain of science: A multiracial feminist examination of the journeys of three women of color in science. *Journal of Research in Science Teaching*, *48*(4), 339–366. https://doi.org/10.1002/tea.20411

Joseph, N. M., Hailu, M., & Boston, D. (2017). Black women's and girls' persistence in the P–20 mathematics pipeline: Two decades of children, youth, and adult education research. *Review of Research in Education*, *41*, 203–227. https://doi.org/10.3102/0091732X16689045

Joseph, N. M., Hailu, M., & Matthews, J. (2019). Normalizing Black girls' humanity in mathematics classrooms. *Harvard Education Review*, *89*(1), 132–155. https://doi.org/10.17763/1943-5045-89.1.132

Kim, A. Y., Sinatra, G. M., & Seyranian, V. (2018). Developing a STEM identity among young women: A social identity perspective. *Review of Educational Research*, *88*(4), 589–625. https://doi.org/10.3102/0034654318779957

King, N. S., & Pringle, R. M. (2019). Black girls speak STEM: Counterstories of informal and formal learning experiences. *Journal of Research in Science Teaching*, *56*(5), 539–569. https://doi.org/10.1002/tea.21513

Ko, L. T., Kachchaf, R. R., Ong, M., & Hodari, A. K. (2013). Narratives of the double bind: Intersectionality in life stories of women of color in physics, astrophysics and astronomy. In P. V. Engelhardt, A. D. Churukian, & N. S. Rebello (Eds.), *Proceedings of the 2012 physics education research conference* (pp. 222–225). AIP Publishing. https://doi.org/10.1063/1.4789692

Ladson-Billings, G. (2009a). Just what is critical race theory and what's it doing in a nice field like education? In E. Taylor, D. Gillborn, & G. Ladson-Billings (Eds.), *Foundations of critical race theory in education* (Vol. 11, pp. 17–36). Routledge. https://doi.org/10.1080/095183998236863

Ladson-Billings, G. (2009b). 'Who you callin' nappy-headed?' A critical race theory look at the construction of Black women. *Race Ethnicity and Education*, *12*(1), 87–99. https://doi.org/10.1080/13613320802651012

Leyva, L. A. (2016). An intersectional analysis of Latin@ college Women's counter-stories in mathematics. *Journal of Urban Mathematics Education*, *9*(2), 81–121. https://doi.org/10.21423/jume-v9i2a295

Leyva, L. A. (2021). Black women's counter-stories of resilience and within-group tensions in the white, patriarchal space of mathematics education. *Journal for Research in Mathematics Education*, *52*(2), 117–151. https://doi.org/10.5951/jresematheduc-2020-0027

Lock, R. M., & Hazari, Z. (2016). Discussing underrepresentation as a means to facilitating female students' physics identity development. *Physical Review Physics Education Research*, *12*(2), 020101. https://doi.org/10.1103/PhysRevPhysEducRes.12.020101

Margolis, J., Goode, J., & Bernier, D. (2011). The need for computer science. *Educational Leadership*, *68*(5), 68–72.

Maxwell, J. A. (2005). *Qualitative research design: An interactive approach* (2nd ed.). SAGE.

McGee, E. (2013). Young, Black, mathematically gifted, and stereotyped. *High School Journal*, *96*, 253–263. https://doi.org/10.1353/hsj.2013.0011

McGee, E. O. (2020). Interrogating structural racism in STEM higher education. *Educational Researcher*, *49*(9), 633–644. https://doi.org/10.3102/0013189X20972718

McGee, E. O., & Bentley, L. (2017). The troubled success of Black women in STEM. *Cognition and Instruction*, *35*(4), 265–289. https://doi.org/10.1080/07370008.2017.1355211

McGee, E. O., & Martin, D. B. (2011). "You would not believe what I have to go through to prove my intellectual value!" Stereotype management among academically successful Black mathematics and engineering students. *American Educational Research Journal*, *48*, 1347–1389. https://doi.org/10.3102/0002831211423972

Mensah, F. M. (2019). Finding voice and passion: Critical race theory methodology in science teacher education. *American Educational Research Journal*, *56*(4), 1412–1456. https://doi.org/10.3102/0002831218818093

Miles, M. L., Agger, C. A., Roby, R. S., & Morton, T. R. (2022). Who's who: How "women of color" are (or are not) represented in STEM education research. *Science Education*, *106*(2), 229–256. https://doi.org/10.1002/sce.21694

Miller, D. I., Nolla, K. M., Eagly, A. H., & Uttal, D. H. (2018). The development of children's gender-science stereotypes: A meta-analysis of 5 decades of U.S. Draw-A-Scientist studies. *Child Development*, *89*, 1943–1955. https://doi.org/10.1111/cdev.13039

Morton, T. R., Gee, D. S., & Woodson, A. N. (2019). Being vs becoming: Transcending STEM identity development through Afropessimism, moving toward a Black X consciousness in STEM. *The Journal of Negro Education*, *88*(3), 327–342. https://doi.org/10.7709/jnegroeducation.88.3.0327

Morton, T. R., & Nkrumah, T. (2021). A day of reckoning for the white academy: Reframing success for African American women in STEM. *Cultural Studies of Science Education*, *16*, 485–494. https://doi.org/10.1007/s11422-020-10004-w

Morton, T. R., & Parson, E. C. (2018). #BlackGirlMagic: The identity conceptualization of Black women in undergraduate STEM education. *Science Education*, *102*, 1363–1393. https://doi.org/10.1002/sce.21477

Nasir, N. S. (2012). *Racialized identities: Race and achievement among African American youth*. Stanford University Press.

National Science Foundation. (2021). Women, minorities, and persons with disabilities in science and engineering. https://ncses.nsf.gov/pubs/nsf21321

Ortiz, N. A., Morton, T. R., Miles, M. L., & Roby, R. S. (2019). What about us?: Exploring the challenges and sources of support influencing Black students' STEM identity. Development in postsecondary education. *The Journal of Negro Education*, *88*(3), 311–326. https://doi.org/10.7709/jnegroeducation.88.3.0311

Pérez Huber, L. (2010). Using Latina/o critical race theory (LatCrit) and racist nativism to explore intersectionality in the educational experiences of undocumented Chicana college students. *Educational Foundations*, *24*(1–2), 77–96.

Prescod-Weinstein, C. (2021). *The disordered cosmos: A journey into dark matter, spacetime, & dreams deferred*. Bold Type Books.

Rahm, J., Gonsalves, A., & Lachaine, A. (2021). Young women of color figuring science and identity within and beyond an afterschool science program. *Journal of Learning Sciences*, *31*(2), 199–236. https://doi.org/10.1080/10508406.2021.1977646

Reissman, C. K. (2008). *Narrative methods for the human sciences*. SAGE.

Ridgeway, M. L., & McGee, E. O. (2018). Black mathematics educators: Researching toward racial emancipation of Black students. *The Urban Review*, *50*, 301–322. https://doi.org/10.1007/s11256-018-0452-2

Rosa, K., & Mensah, F. M. (2021). Decoloniality in STEM research: (re)framing success. *Cultural Studies of Science Education*, *16*, 501–508. https://doi.org/10.1007/s11422-020-10008-6

Russell, M. L., & Russell, J. A. (2015). Black American undergraduate women at a PWI: Switching majors in STEM. *The Negro Educational Review*, *66*(1–4), 101–125.

Smith, K. C., Boakye, B., Williams, D., & Fleming, L. (2019). The exploration of how identity intersectionality strengthens STEM identity for Black female undergraduates attending a Historically Black College and University (HBCU). *The Journal of Negro Education*, *88*(3), 407–418.

Solórzano, D., Ceja, M., & Yosso, T. (2000). Critical race theory, racial microaggressions, and campus racial climate: The experiences of African American college students. *Journal of Negro Education*, *69*(1–2), 60–73.

Solórzano, D. G., & Yosso, T. J. (2002). Critical race methodology: Counter-storytelling as an analytical framework for education research. *Qualitative Inquiry*, *8*(1), 23–44. https://doi.org/10.1177/107780040200800103

Strauss, A., & Corbin, J. (1994). Grounded theory methodology. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 217–285). SAGE.

Tan, E., Calabrese Barton, A., Kang, H., & O'Neill, T. (2013). Desiring a career in STEM-related fields: How middle school girls articulate and negotiate identities in-practice in science. *Journal of Research in Science Teaching*, *50*(10), 1143–1179. https://doi.org/10.1002/tea.21123

Türkmen, H. (2008). Turkish primary students' perceptions about scientist and what factors affecting the image of the scientists. *Eurasia Journal of Mathematics, Science & Technology Education*, *4*(1), 55–61. https://doi.org/10.12973/ejmste/75306

Wade-Jaimes, K., King, N. S., & Schwartz, R. (2021). "You could like science and not be a science person": Black girls' negotiation of space and identity in science. *Science Education*, *105*(5), 1–21. https://doi.org/10.1002/sce.21664

Wade-Jaimes, K., & Schwartz, R. (2018). "I don't think it's science:" African American girls and the figured world of school science. *Journal of Research in Science Teaching*, *56*(6), 679–706. https://doi.org/10.1002/tea.21521

Walls, L. (2012). Third grade African American students' views of the nature of science. *Journal of Research in Science Teaching*, *49*(1), 1–37. https://doi.org/10.1002/tea.20450

Walls, L. (2022). A critical race theory analysis of the draw-a-scientists test: Are they really that White? *Cultural Studies of Science Education*, *17*(4), 141–168. https://doi.org/10.1007/s11422-022-10107-6

Wing, A. K. (2000). Introduction: Global critical race feminism for the twenty-first century. In A. K. Wing (Ed.), *Critical race feminism: A reader* (pp. 1–23). University Press.

Wing, A. K. (Ed.). (1997). *Critical race feminism: A Reader*. New York University Press.

Wright, C., & Riley, A. (2021). Mitigating the need for resiliency for Black girls: Reimagining the cultural brokering through a lens of science as white property. *Cultural Studies of Science Education*, *16*, 495–500. https://doi.org/10.1007/s11422-020-10005-9

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