

II. Building a “Home-Place” in STEM

Leveraging Race, Resistance, and Cultural Wealth to Foster STEM Counterspaces for Youth of Color

TIERA TANKSLEY

Abstract: This paper examines the power and potentiality of STEM (science, technology, engineering, and mathematics) homeplaces as places of refuge, spaces of healing, and sites of radical possibility for Students of Color. Qualitative interviews with two Women of Color educators ground this study, and provide insight into the programmatic features, including cultural norms, policies and practices, that fostered feelings of safety, love, healing, and empowerment for Youth of Color in an otherwise toxic and exclusionary STEM field.

Introduction

Historically, African American people believed that the construction of a homeplace, however fragile and tenuous...had a radical political dimension. Despite the brutal reality of racial apartheid, of domination, one's homeplace was the one site where one could feely confront the issue of humanization, where one could resist. (hooks 2014)

In her seminal piece “Homeplace (A Site of Resistance),” hooks describes the sociopolitical power and potentiality of culturally situated and race-conscious “homeplaces” for People of Color. Definitively, a homeplace is a space of refuge that fosters a culture of love, support, humanization, nurturance, and restoration for People of Color. Crafted by Women of Color, homeplaces play an indispensable role in the survivance of marginalized people namely because they “include caring for one another, for children...in ways that elevated our spirits, that kept us from despair, [and] that taught some of us to be revolutionaries able to struggle for freedom.” This latter piece is crucial, and illuminates the indispensable connection between homeplaces as sites of care, love, and hope, and homeplaces as sites of resistance, transformation, and radical possibility.

Although hooks' (1990) original notion of homeplace was situated in a private, family home – a location outside of physical spaces that reinforced racial oppression – Kelly (2020) reminds us that homeplaces can also exist within oppressive spaces, such as schools and classrooms (p. 451). Serrano's (2020) work on academic homeplaces further illuminates how Students of Color construct racially affirming homeplaces in order to transformatively resist hostile racial climates on campus. In addition to sustaining a community of love, resistance, and healing, academic homeplaces foster “a sense of family and home for students who must navigate the daily challenges of racism in institutions of higher education and beyond” (Serrano, 2020, p. 14). They are also spaces that offer culturally sustaining pedagogies, mentorship, and support, and increase students' access to Mentors of Color who can draw upon shared experiences with racial domination to inspire, support, and meaningfully connect with their students. In these ways, academic homeplaces prepare Students of Color to survive and resist “the daily reminders that these institutions were not built for the students who now occupy their seats” (p.14).

In the context of STEM, where racist and sexist cultures consistently mediate the experiences of marginalized students, academic homeplaces can prove to be beneficial for educators interested in fostering more supportive and racially healing learning environments. Though there is a growing body of scholarship documenting the educational and sociopolitical benefits of academic homeplaces, there remains a critical dearth in scholarship detailing the practical steps and pedagogical strategies that educators can leverage to create and sustain homeplaces in the racially fraught

discipline of STEM. To address this gap, this paper explores how two Women of Color educators created race-conscious and culturally sustaining homeplaces for Students of Color in STEM. The following research questions ground this study:

1. What programmatic features foster educational resilience in general, and STEM resilience in particular, for Students of Color?
2. How do educators leverage their sociopolitical identities and or minoritized funds of knowledge to create and sustain such programmatic safe spaces?

In the following section, I detail the permanence and pervasiveness of intersectional oppression in STEM for marginalized youth, and the power and potentiality of academic homeplaces as sites of resistance, retention, and radical possibility.

Literature Review

Extant literature reveals that Students of Color consistently endure inequitable, dehumanizing, and racially hostile conditions as they traverse the STEM education pipeline (Collins et al., 2020; Ireland et al., 2018; King & Pringle, 2019). In general, Students of Color are more likely to attend schools that are underfunded, dilapidated, and racially segregated; have high rates of teacher and principal turnover; and lack high-quality learning resources, such as digital technology, lab space, and up-to-date text books. The schools that serve the highest rates of Black and Brown students are simultaneously less likely to have gifted and talented (GATE) programs, advanced placement (AP) classes and academically rigorous extracurriculars, like coding or robotics, that adequately prepare students for STEM careers and college pathways. Alternatively, when STEM-rich learning resources are available, Students of Color are rarely identified as gifted, talented, or eligible for high-performing learning tracks (Collins et al., 2020; Evans-Winters, 2014). Instead, they are disproportionately tracked into remedial and low-performing pathways regardless of their interests, engagement, or achievement in STEM. Such systematic barriers quietly funnel Black and Brown youth out of STEM college and career pathways.

Unfortunately, even when Students of Color are enrolled in well-funded schools with adequate STEM facilities and learning resources, they still experience challenges with achievement, engagement, and retention (Davis, 2020). Studies have identified a multitude of factors behind these dismal outcomes, including culturally irrelevant curricula, lack of diverse representation, limited access to Peers and Mentors of Color, and the ubiquity of racial and gendered microaggressions. Cumulatively, these factors foster racially hostile learning environments for marginalized students, and have been identified as some of the primary causes of their eventual disengagement from and disinterest in STEM.

Despite the ubiquity of racial hostility in STEM, educators have worked diligently to foster racially affirming and culturally situated “safe spaces” that can foster resistance, resilience, and retention for marginalized students (Serrano, 2020). Because they directly challenge the racially oppressive STEM status quo, these identity-centered spaces are considered to be STEM counterspaces, and have a profound impact on the educational experiences of Youth of Color (King & Pringle, 2019; Lee et al., 2015; Sandoval, 2013; Scott, 2009; Scott & Garcia, 2016; Scott & White, 2013; Scott et al., 2015;). As defined in the literature, counterspaces are academic and social spaces that allow Students of Color “to promote their own learning and experiences, facilitate discussions on experiences of overt racism, and promote a positive racial climate” (Serrano, 2020, p. 5). They can be physical, digital, verbal or spiritual spaces that provide a protective barrier against racial assaults, and in doing so offer opportunities to heal and, subsequently, “fight back” against oppressive conditions (Serrano, 2020; Solorzano, 2022). Unlike traditional STEM spaces that operate from culturally deficit and racially hostile frameworks, academic homeplaces maintain an asset-based view of Students of Color, and place their cultural identities and racialized experiences at the center of learning rather than on the margins. They simultaneously provide invaluable access to Peers and Mentors of Color – and research has consistently linked

sustained access to mentors from similar backgrounds as a crucial component of retention and success in STEM (Dickens et al, 2021; Griffin et al., 2010; Kricorian et al., 2020).

Importantly, counterspaces embrace alternative approaches to STEM teaching, learning, and mentoring that center, rather than obscure, the cultural and racial wealth of marginalized communities (Serrano, 2020). Yosso (2005) defines community cultural wealth as “an array of knowledges, skills, abilities, and contacts possessed and used by Communities of Color to survive and resist racism and other forms of oppression” (p. 154). By validating students’ cultural, racial, and ethnic identities, and meaningfully incorporating their community cultural wealth into the space, STEM counterspaces not only increase Students’ of Color achievement, interest, and persistence in critical science, but also improve their overall sense of STEM self-concept, critical science agency, and interest in pursuing STEM college and career pathways (Calabrese & Tan, 2019; Sandoval, 2013; Scott & Garcia, 2016; Scott & Zhang, 2014; Scott et al., 2017; Searle & Kafai, 2015). In addition to educational benefits, culturally situated counterspaces simultaneously foster student agency and activism that positively impacts students’ lives beyond the contours of the classroom. In many instances, the sense of agency and empowerment gained from participation in culturally responsive STEM programs empower students to transformatively resist systems of domination in every facet of their lives and schooling experiences.

While critical race theory’s (CRT) counterspace framework can illuminate how STEM counterspaces foster resistance and critical consciousness, hooks’ notion of homeplace can shed light on the indispensable, yet largely overlooked socioemotional benefits of these fugitive spaces. Though they are a type of counterspace, homeplaces are distinct from traditional counterspaces in that they unapologetically center hope, healing, and humanization as key determinants of survival and resistance. In homeplaces, the focus is on love and nurturing; they are about healing the soul, and giving Students of Color a chance to relax, let their guard down, and breathe. Crafted by Women of Color, homeplaces are spaces of refuge where People of Color can validate and care for one another; name, process, and heal from the atrocities of everyday racism; and be humanized in ways that prepare them to fight back and resist against racist domination.

Given their multifaceted benefits, I believe that homeplaces could be revolutionary for Students of Color in STEM. However, there is a significant dearth in scholarship documenting the power and potentiality of homeplaces in STEM. More research must be done to understand the norms, policies, and practices of educators that successfully construct STEM homeplaces for historically marginalized students. Without this essential insight, the field lacks practice-oriented means of replicating and scaling these invaluable learning spaces.

Study

This research is part of the All Together Now study, funded by the NSF Advancing Informal STEM Learning (AISL) program. The study investigates how informal STEM learning (ISL) programs can broaden participation in STEM by building STEM-relevant social capital and cultural connection for underrepresented and historically marginalized youth. The research team conducted observations and interviews at three ISL programs in Southern California with varied approaches and organizational contexts, serving predominantly Latinx youth. The organizations were selected because they are focused on achieving STEM equity for historically marginalized youth, and they also embody key elements of connected learning, including project-based and interest-driven programming, a safe and socially supportive environment, and culturally responsive approaches. While data collection for the larger study consisted of regular program observations to observe unique program features of each organization, youth interviews, and educator interviews, this paper analyzes a subset of data focusing solely on Women of Color educators. The next section centers the voices, experience, and pedagogical insights of two WOC educators, Linda and Evelyn (all names have been anonymized).

Findings

A rigorous thematic analysis of educator interviews revealed three main findings about STEM homeplaces: 1) they provide students with frequent opportunities to discuss, process, and heal from everyday racism; 2) they actively protect students from racist domination in school, in society, and in STEM; and 3) they catalyze students' ability to survive and resist racism in school and society.

Homeplaces provide students with opportunities to discuss, process, and heal from racism.

One of the main features of the subset of programs for this study was a staunch commitment to seeing, supporting, and listening to Students of Color in ways that were atypical in traditional STEM settings. Evelyn captures this loving approach to STEM mentorship:

There's been several times, it probably happens once a week, where they don't even work on anything. They just sit, and we just talk about everything...They like to talk to me a lot. That's how I feel like I connect with them. I build my relationship with them, and I make time for them. If they just want to talk, let's just talk.

Evelyn's willingness to hold space for and talk with students is radically different from their traditional STEM experiences, where the students are often ignored, overlooked, and talked over. Because Evelyn intentionally fosters a community of support, sharing, and open dialogue, the students regularly open up to her about the racial discrimination experience in school. For instance, Evelyn recalls a time she helped students' process and heal from a racist incident at school:

Then when one of them shares a story about what happens in school, especially with the whole Trump thing, ... how because they're darker skinned how people were judging them, and people were calling them names, and they were being racist... They would come in here, and they would be down. I'm like, guys, you're going to get people like that everywhere you go. I would tell them about my brother. I say my brother works for Northrop. ... and you should see how these white engineers that are probably 10 years older than him, or some of them 25 years older than him are like, "He's going to give us the presentation? This little Mexican boy?" They put him down, but you know what? He did it.

Importantly, Evelyn does more than listen to and hold space for her students – she actively seeks out ways to support and inspire them. After discussing the racist incident, Evelyn tapped into her extensive community networks to find other Latinx people who experienced racism in STEM and found ways to navigate and survive it. In this specific case, she reached out to her brother and asked him to share his stories of survival and resistance with the students. "I would Facetime Peter, and I'd be like, do you have time? Can we Facetime you? So, then I'll just put the TV on the thing, and I'll just be like, Peter, can you tell them about your story? Kids are going through people being racist and stuff like that."

For Evelyn, showcasing how everyday people not only survived, but thrived in racially hostile STEM environments is an indispensable part of her mentorship model.

I try to bring people... I know a lot of people...even people in my family, I bring them in to kind of help give the kids examples. Look, this Latino boy did it. You can do it too. Like, he is going through racism. Look how he's approaching it. Look how he's treating it and coping with things and doing things. You guys can do it too. It helps them a lot, just seeing someone that's just like them or reflects them, you know?

Ultimately, by holding space for students to discuss and process racist harm, Evelyn cultivates a STEM homeplace that protects Students of Color from the dehumanization and oppression that pervades traditional schools and classrooms.

Homeplaces actively protect students from racist harm and educational pushout.

In addition to providing spaces where students could discuss, process, and eventually heal from racism, the educators in this study took it upon themselves to actively protect their students from racist harm that occurred in their schools and classrooms. For instance, Evelyn describes a time she leverages her experiential knowledge, academic capital, and critical consciousness to challenge racist domination in the form of educational pushout. After explaining how she supported Ernie, a “very, very shy student” through his adolescent and early teenage years, Evelyn shares a powerful story about how she continued to protect him from racial inequity in his college years:

He wants to be a doctor. He wants to do medicine, and he's a DACA. You don't know how much I helped him. The school was trying to charge him international fees because he was a DACA. I said, no, he is not. So I called, and I pretended I was the mom, and I said, look, my son has been living in California for several years, since he was two. He's not an international student. He's just a DACA student. I know there's a law. I'm going to call my lawyer.... So, they transferred me to the dean, and the mom was here [with me]. I was just pretending I was her. When she told me, I was like, “Do you know that they fixed it? and he gets like two or three thousand dollars every semester because of the grants and everything he's getting, because he gets straight As.” The mom was crying. The lady still calls me. She still sends me messages. She still comes. She's so grateful. She's like, “If it wasn't for you, I was already thinking, like how am I going to pay \$8,000 in a year.” It was intense, but people take advantage of [Latinx and undocumented people], and that's why we're here. We're here for all that. It's just not one thing. It's so many things.

For Evelyn, protecting students and their families is a crucial part of fostering educational resilience and STEM persistence for marginalized students. Her love for students is palpable, and she admits, “I could almost put my hands in fire” to ensure that they get an equitable education.

This example is important because it demonstrates that homeplaces are not passive spaces where students simply escape or find respite from racial hostility; they are radical, action-oriented spaces that readily challenge racist structures that threaten the lives, well-being, and academic successes of Students of Color.

Homeplaces catalyze students' ability to transformatively resist racism in school and society.

In addition to protecting, affirming and supporting Students of Color, the WOC educators in this study simultaneously prepared them to transformatively resist oppressive conditions that existed within and beyond the school context. To do this, they were intentional about fostering students' critical consciousness through critical education. For Linda, who wants the students “to care about the environment...to be concerned about their community,” critical consciousness and civic service was ingrained into each and every project she taught.

For instance, following the rise of COVID-19 and the shift to distance learning, Linda had the students study the filter mechanisms of face masks. Rather than simply understand the mechanics and importance of filtering systems, Linda had the students consider dis/ability justice and whether or not their prototypes were accessible to folks with physical disabilities. She remembers telling her students, “I want you guys to make your own safe masks, but ... I want you to also

think about people that wear glasses...what about people who can't tie behind their back or what if the person doesn't have an arm, how are they going to put a face mask on?...How can we make things easier for people who could use that?"

She also had the students do projects about environmental justice in their local community. For instance, Linda had the students conduct a civil engineering research project on water waste and pollution in the resort district of Anaheim. The students, whose parents and family members worked in resorts, immediately noticed the environmental inequities that pervaded these billion-dollar tourism corporations. After interviewing loved ones and doing their own research, the students realized that hotels were creating an exorbitant amount of pollution from single-use plastic toiletries. From there, Linda led her students through a process of grassroots activism in hopes of improving the environmental injustices that permeated the local community:

They wrote to the hotels, they wrote to the city. The city had them come, they went with the mayor and the main council members. They went to talk to the mayor and they explained their project, why they were concerned. And then what they did was they addressed it and they had the head of the hotels of Anaheim come and listen to what our kids tried to say. And I think what, my thing is, I want them to also have a voice in their world and I want them to understand that.

Importantly, Linda's incorporation of critical consciousness, activism, and agency were strategic, and went beyond superficial interests in making STEM more relevant or engaging content. She is clear that her choice to transform MESA into a civil service learning space was to empower students to make tangible change to the oppressive conditions that mediate their lives and schooling experiences.

Discussion

The findings from this study provide preliminary insights into the programmatic features, pedagogies, and mindsets that foster resilience and retention for Students of Color in STEM. Specifically, STEM homeplaces are spaces where marginalized students can name, process, and cope with the trauma of everyday racism; be lovingly and vigorously protected from educational pushout and racist microaggressions; and gain the critical consciousness and transformative agency to not only survive oppressive conditions, but also to actively transform them.

To foster this space, the Women of Color educators readily leverage culturally situated and identity-specific pedagogies – or “homeplace pedagogies” – as a way to increase students' feelings of safety, nurturance, and validation in the program. These homeplace pedagogies purposefully promote feelings of safety, healing, agency, and critical consciousness for Students of Color, who in turn leverage the empowerment they gain from these racially affirming and radically loving spaces to transform the oppression conditions that permeate their lives and schooling experiences. The Women of Color educators in these spaces were committed to protecting and uplifting their students, and readily leveraged community cultural wealth – including social connections, financial resources, familial networks, and linguistic skills – to challenge and transform the matrices of domination that threaten to harm their students both within and beyond the STEM learning environment.

As a result of these homeplace pedagogies, the programs maintained significantly high rates of engagement, retention, and achievement in STEM for minoritized students. These results were not just contained to the local STEM program – in fact, Students of Color that participated in these programs had long-lasting success in college and career STEM pathways long after their time in the program ended.

Conclusion

The STEM homeplaces that were examined in this study served as a protective barrier against racist oppression and

STEM pushout. The educators in these spaces leveraged homeplace pedagogies that included caring for and nurturing students; providing opportunities for students to discuss, process, and heal from racism; teaching students how to challenge and interrogate racist structures; fostering students' critical consciousness and activist potential; and making meaningful connections between STEM and students' everyday lives and cultural experiences.

References

- Collins, K. H., Joseph, N. M., & Ford, D. Y. (2020). Missing in action: Gifted Black girls in science, technology, engineering, and mathematics. *Gifted Child Today*, 43(1), 55-63.
- Davis, S. (2020). Socially toxic environments: A YPAR project exposes issues affecting urban Black girls' educational pathway to STEM careers and their racial identity development. *The Urban Review*, 52(2), 215-237.
- Dickens, D. D., Ellis, V., & Hall, N. M. (2021). Changing the face of STEM: Review of literature on the role of mentors in the success of undergraduate black women in STEM education. *Journal of Research Initiatives*, 5(3), 14.
- Evans-Winters, V. E. (2014). Are Black girls not gifted? Race, gender, and resilience. *Interdisciplinary Journal of Teaching and Learning*, 4(1), 22-30.
- Griffin, K. A., Perez, D., Holmes, A. P., & Mayo, C. E. (2010). Investing in the future: The importance of faculty mentoring in the development of students of color in STEM. *New Directions for Institutional Research*, 2010(148), 95-103.
- hooks, b. (2014). Homeplace: A site of resistance. *Yearning: Race, gender and cultural politics* (pp.41-50). 2nd edition, Routledge.
- Ireland, D. T., Freeman, K. E., Winston-Proctor, C. E., DeLaine, K. D., McDonald Lowe, S., & Woodson, K. M. (2018). (Un)hidden figures: A synthesis of research examining the intersectional experiences of Black women and girls in STEM education. *Review of Research in Education*, 42(1), 226-254.
- Kelly, L. L. (2020). "I love us for real": Exploring homeplace as a site of healing and resistance for Black girls in schools. *Equity & Excellence in Education*, 53(4), 449-464
- 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.
- Kricorian, K., Seu, M., Lopez, D., Ureta, E., & Equils, O. (2020). Factors influencing participation of underrepresented students in STEM fields: matched mentors and mindsets. *International Journal of STEM Education*, 7(1), 1-9.
- Love, B. L. (2016). Anti-Black state violence, classroom edition: The spirit murdering of Black children. *Journal of Curriculum and Pedagogy*, 13(1), 22-25.
- Morris, M. (2016). *Pushout: The criminalization of Black girls in schools*. The New Press.
- Scott, K. A., & White, M. A. (2013). COMPUGIRLS' standpoint: Culturally responsive computing and its effect on girls of color. *Urban Education*, 48(5), 657-681.
- Serrano, U. (2020). 'Finding home': campus racial microclimates and academic homeplaces at a Hispanic-Serving Institution. *Race Ethnicity and Education*, 1-20.
- Solorzano, D. G. (2022). My journey to this place called the RAC: Reflections on a movement in critical race thought and critical race hope in higher education. *International Journal of Qualitative Studies in Education*, 1-12.
- Yosso, T. J. (2005). Whose culture has capital? A critical race theory discussion of community cultural wealth. *Race ethnicity and education*, 8(1), 69-91.

Acknowledgments

This research was supported by the National Science Foundation as part of the Advancing Informal STEM Learning initiative and could not have been carried out without the help of research team members: Dr. Maïko LeLay, Dr. Oshin

Khachikian, Jennifer Cabrera, R. Mishael Sedas, Nicole Balbuena, Teresa Ramirez, Judith Trujillo, Genesis Paniagua, and Stephanie Morales. We would like to thank the passionate STEM informal learning organizations and youth participants for sharing their stories and perspectives.