Choosing Self-Care and Preservation: Examining Black Women STEM Faculty's Decision to Pursue Entrepreneurship and Entrepreneurship Education Programming

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Abstract

Despite recent STEM diversity initiatives, there still exists structural barriers on who can pursue their STEM aspirations. The lack of diversity in STEM fields hinders individual self-actualization and economic advancement as well as STEM innovation efforts. Notably, Black women remain underrepresented in STEM higher education and academic entrepreneurship. The goal of this project is to increase the understanding of the entrepreneurship-related experiences of Black women in STEM higher education. Specifically, we examine how the erasure and marginalization of Black women in STEM academic entrepreneurship contributes to their minoritization in STEM. In doing so, we seek to identify ways to improve their experiences in STEM higher education and entrepreneurial spaces. Relying on Collins' (1990) domains of power framework, the following question guides the study: To what extent do everyday encounters and practices of marginalization in STEM higher education and entrepreneurial education spaces shape Black women's engagement in STEM entrepreneurial education programming? To answer this question, we conducted semi-structured interviews (n=7) of Black women faculty in STEM higher education who have engaged or not engaged in entrepreneurship education programming. These conversations reveal the various ways Black women navigate in and outside of entrepreneurship education programming to innovate their fields.

Introduction

In the United States, national calls have emerged for expanding the science, technology, engineering, and mathematics (STEM) workforce [1]. Government officials suggest that an increase in the number of STEM professionals and innovations is important for meeting rising social, economic, and environmental concerns across the country [2], [3]. One approach for STEM workforce development is the launch of STEM entrepreneurship education programming. STEM entrepreneurial education programs (EEPs) promote and support university faculty, students and administrators in their transformation of STEM research into marketable products [4]–[8]. Since their emergence in the late 20th century, STEM EEPs have assisted in the production of thousands of patents and innovations aimed at producing national and local social change [9].

Despite their benefits, STEM EEPs have struggled to engage Black women academic professionals. STEM EEPs' limited diversity hinders STEM innovation at national and local levels as well as restricts access and resources for Black women in pursuing STEM academic entrepreneurship [2], [3], [10]. Therefore, the goal of this paper is to examine the following research question: To what extent do everyday encounters and practices of marginalization in STEM higher education and entrepreneurial education spaces shape Black women's engagement in STEM EEPs? Relying on Collins' [11] domains of power framework, this paper investigates how day to day encounters and practices of marginalization shape Black women STEM faculty's decision to participate in STEM EEPs. This paper offers evidence of how the decision to pursue STEM EEPs for Black women STEM faculty is rooted in resistance strategies of self-care and preservation from exclusionary interpersonal dynamics in academia and entrepreneurial spaces.

Literature Review

During the late 20th century, EEPs became increasingly popular in United States higher education institutions [12]. At the time, colleges and universities were seeking new ways to increase their financial revenue due to decreases in state and national funding [13], [14]. The rise of entrepreneurship nationwide provided universities and colleges with the opportunity to test and capitalize the commercial viability of academic research innovations [5]. This newfound entrepreneurial interest was assisted by governmental legislation like the 1980 Bayh-Dole Act, which expanded opportunities for higher education institutions to transform federally funded research into marketplace products [4]. Shortly after the implementation of the Bayh-Dole Act, higher education institutions started developing EEPs to provide opportunities for individuals to gain knowledge and expertise on entrepreneurial mindsets and behaviors [15].

The development of STEM EEPs in the United States coincided with external pressures from the nation [16]–[18]. Following the space race during the Cold War, the United States was invested in upholding its' global image of being a leader in STEM innovation [17], [18]. The expansion of EEPs offered opportunities for universities and governmental programs to partner with STEM faculty in United States' colleges and universities. STEM EEPs also allowed United States' higher education institutions to work on translating their research into scientific and technological products useful for societal advancement [15], [19], [20]. Currently, STEM EEPs support the United States' innovation ecosystem by producing thousands of patents and hundreds of millions of dollars in financial revenue [9].

Prior work has explored the engagement patterns of women [21]–[24] and racially minoritized faculty [25]–[27]. This body of literature suggests a lack of gender and racial diversity in STEM EEPs can be attributed to systemic barriers in STEM higher education [28]–[31]. For example, STEM higher education organizations' prioritization of White men in their citational practices, grant funding and awards hinders women and racially minoritized faculty from meeting STEM EEPs' entrance requirements [25], [32]–[36]. Additionally, even when minoritized populations gain access into STEM EEPs, the racial and gendered climate of STEM EEPs can deter women and racially minoritized faculty from engaging [25], [26], [37].

Although this prior work is useful, the clumping together of only women or racially minoritized populations' experiences in STEM EEP literature hinders understanding the engagement patterns for Black women. Black feminist, entrepreneurship, and STEM higher education scholarship note that Black women experience a 'double bind' in STEM higher education and entrepreneurial spaces, meaning they are uniquely impacted by both racial and gendered oppressions [38]–[42]. By only focusing on the effects of one oppressive system (i.e., White supremacy or patriarchy), STEM EEP research fails to capture the overlapping nature of systems of power for Black women [11], [38], [39], [43]–[49]. The goal of this paper is to build on prior Black feminist, entrepreneurship, and STEM higher education literature by focusing specifically on the experiences of Black women. In doing so, this paper seeks to identify the underlying mechanisms that contribute to Black women's lack of engagement in STEM EEPs.

Black Feminism as a Conceptual and Analytical Tool
Black feminist ways of knowing emerge from a historical tradition of Black women using the conditions of their lives to understand their relationship to sociohistorical locations, powered relations, and time [50]. The theoretical consensus of Black feminist perspectives suggests

overlapping systems of power (i.e., White supremacy, patriarchy, ableism, classism) that exist in the United States shape individual experiences [11], [38], [43]–[50]. According to these perspectives, Black women are not merely victims of these oppressive forces but come from an 'inherited' tradition of using liberatory storytelling and practices to improve the social conditions of themselves, their communities and all those on the margins [11], [38], [43]–[51].

This paper relies on one Black feminist perspective, Collins' [11] domains of power framework, as a conceptual and analytical tool for understanding Black women's experiences in STEM EEPs. Collins' [11] domains of power framework situates the individual biographies, experiences and trajectories of Black women as connected to four interrelated power domains – structural, disciplinary, hegemonic and interpersonal [11]. The goal of this study is to interrogate how one of these domains – the interpersonal one – plays a part in Black women's engagement in STEM EEPs. The interpersonal domain illustrates how Black women's marginalization is enacted through everyday practices and encounters. Collins' [11] domains of power framework also constructs Black women as agentic members with capabilities of resisting these everyday encounters and practices. According to Collins' [11] , Black women resist oppressive systems in a myriad of ways by "pushing against, stepping away from and shifting the terms of their participation in power relations (p., 275)." Therefore, the goals of this paper are to also examine if Black women's engagement in STEM EEPs is shaped by their resistance strategies [11].

Methods
This study incorporates a critical phenomenology approach to examine Black women STEM faculty's engagement in STEM EEPs. The goal of phenomenological projects is to generate understandings of a phenomenon based on the perspectives of individuals who have encountered the phenomenon of interest [52]–[55]. Traditional phenomenological approaches hold objective or constructivist assumptions, which separates the researcher and participant from the societal structures in which they are embedded [53]–[55]. Critical phenomenological research seeks to examine a phenomenon of interest with the goal of using the expertise of experiential observers to disrupt and make visible overlapping systems of power [56]–[60]. These goals align with Black feminist traditions of relying on the lived experiences of Black women to identify the function of overlapping systems of power for Black women's empowerment [11], [50], [61].

Data Collection
The data collected from this study comes from a larger study on women STEM faculty's engagement in entrepreneurship education programming. Participants were recruited from R1, R2 and teaching universities[1] in the United States. The research team relied on their professional networks and snowball sampling to identify women faculty across racial groups who were STEM faculty who had engaged or not engaged in STEM EEPs [62]. For this study, we examined semi-structured interviews (n=7) of Black women STEM faculty in higher education institutions in the United States. The final participant pool varied across STEM disciplines and participation status in entrepreneurship education programming (refer to Table 1). Each interview took place via Zoom and lasted around an hour. Each participant chose a pseudonym for confidentiality reasons.

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[1] The university classifications were created by the Carnegie Foundation for the Advancement of Higher Education. R1 refers to United States' universities with very high research activity. R2 refers to United States' universities with high research activity.

The interview protocol consisted of questions pertaining to background information and experiences with entrepreneurship and entrepreneurship education programming. The first set of questions asked about their role as a faculty member. The next set of questions were about participants' awareness of entrepreneurship education programming, connections to potential participants of entrepreneurship education programming and reasons for engaging or not engaging in entrepreneurship education programming. The last set of questions asked participants to describe ways to improve entrepreneurship education programs, with specific attention to women faculty experiences.

Table 1. Description of Participants

Participant	Race and Gender Positionality	Discipline	STEM Entrepreneurship Education Programming Participation Status (Yes/No)
Dr. J	Black woman (she/her)	Engineering	No
Dr. Sh	Black woman (she/they)	Engineering	No
Dr. C	Black woman (she/her)	Engineering	No
Dr. W	Black woman (she/her)	Engineering	Yes
Dr. S	Black woman (she/her)	Engineering	Yes
Dr. O	Black woman (she/her)	Engineering	Yes
Dr. Wu	Black woman (she/her)	Natural Science	Yes

Data Analysis
The data was analyzed using a general inductive analytic plan, meaning we analyzed the interviews in line with the conceptual framework and study's objectives [63], [64]. The first step of the data analysis involved reading through the transcripts so the lead researcher could familiarize themselves with the data. Next, the lead researcher identified significant statements in each of the interviews pertaining to codes reflective of the Collins' [11] domains of power framework. The *interpersonal domain* code was created to describe when a participant mentioned an instance or norm of being excluded by an individual or group of people in academia or entrepreneurship, particularly based on their social position (i.e., microaggression, discriminatory remark). The *interpersonal empowerment* code was created to describe when a participant described their efforts to resist, confront or engage in efforts to sustain themselves from exclusionary interpersonal dynamics in academia or entrepreneurship. After applying the codes to each of the participant interviews, the lead researcher met with a research assistant to make sure the code descriptions were in alignment with Collins' [11] domains of power framework. The lead researcher revised the code descriptions to obtain better alignment with the conceptual framework after obtaining feedback from the research assistant. Then, the lead researcher applied the revised codes to participant responses. Next, the lead researcher and research assistant met again to assess the reliability of the codes and obtained 100% intercoder agreement. Afterwards, the lead researcher reviewed the codes to identify themes. Lastly, each theme was validated by each member of the research team.

The Positionality of the Research Team

The first author arrives at this work as a Black feminist scholar who is working towards a PhD in the fields of education and psychology. As a Black feminist, the first author considers herself as a part of an 'inherited tradition' of examining how the conditions of our lives are shaped by the sociohistorical influences and power relations in which we are embedded [50]. Her lived experiences as a cis-gendered Black woman and academic training in sociological and STEM higher education disciplines prompted her to want to understand how STEM higher education organizations in the United States often reproduce systemic inequities based on their relationship to institutionalized overlapping systems of power. In doing this work, the first author sees herself as connected to a larger collective effort of reimagining and constructing new ways of improving STEM higher education spaces in ways where each person, specifically those who find themselves on the margins, can pursue their STEM aspirations [51].

The second, third and fourth authors, an Asian man, a White woman, and an African American woman, all arrive at this work as engineers and engineering education researchers with commitments for improving engineering education. They contributed to the paper by offering feedback on the research design, methodology and interpretation of the findings. Additionally, they assisted the lead researcher in situating the research findings within an STEM higher education and entrepreneurial programming context. The interviews in this study come from a larger project in which the second and third author collected data. The second and third author leveraged their relationships with women of color faculty in STEM higher education to recruit participants.

Limitations
There are several limitations of the study. One limitation is that the data collected comes from a larger study on women's engagement in STEM EEPs. The original project aimed to critically examine women STEM higher education faculty's decision-making surrounding participation in STEM EEPs. Because of this, we recognize that our findings may not fully capture Black women's experiences based on their experiences with overlapping systems of power in STEM higher education and entrepreneurial spaces. Another limitation of the study is that all but one of our participants is a faculty member in an engineering discipline. The lack of diversity across STEM disciplines hinders understanding how participation in STEM EEPs for Black women may vary based on their discipline. Lastly, we recognize a limitation of the study is the small population size. However, it should be noted the goal of this paper is not to generalize the experiences of all Black women. Rather, this paper aims to use the participants' experiences to identify underlying mechanisms that may explain the engagement patterns of Black women STEM faculty in STEM EEPs.

Results
Two themes emerged from our study: 1) Black women STEM faculty experience day to day encounters and practices of exclusion and harm in academia and entrepreneurial spaces and 2) Self-care and preservation is a motivator for Black women STEM faculty's STEM entrepreneurial education program decision making.

Theme 1: Black women STEM faculty experience day to day encounters and practices of exclusion and harm in academia and entrepreneurial spaces

Participants discussed experiencing exclusionary and harmful encounters and practices in STEM higher education and entrepreneurial spaces. Dr. Wu noted, "As a woman, as a minority, there's always so many different challenges that's there. It's always there, it's always there." One of these challenges was not having access to supportive interpersonal relationships in their universities and academic departments. Dr. J remarked,

> *"I came to [university] recognizing that no one's going to help you, Dr. J, so you'd better write the papers, and you'd better write the proposal. That's exactly what I did, I wrote the papers. I wrote the proposals. I was the PI. I was the first author on most of my papers. People were not saying, "Oh Dr. J, come work with us, we'd just love you to have to work with us."*

Dr. J describes how she had to solely rely on herself to accomplish her research endeavors while working as a faculty member in her university. Later, Dr. J explained how being excluded from supportive interpersonal relationships in academia took a toll on her wellbeing. Dr. O expanded on this point by discussing how Black women often experience social exclusion in academia. She states,

> *"I think being a Black woman in academia, you get comfortable with being overlooked and dismissed and X, Y, and Z, and your survival relies on you not taking things personal."*

Another challenge mentioned by some of our participants was how individuals in entrepreneurial spaces often devalue the intellectual and innovative contributions of women and racial minorities. Dr. Sh mentioned, "From what I hear from my friends in CS [computer science], I hear horror stories about how [CS friends] felt like when I went and talked to investors, I felt like I wasn't taken seriously." In response, Dr. O mentioned how recent calls to diversity in entrepreneurial spaces are undermined by practices of technology officers perceiving women and minority faculty innovations as less valuable. Dr. O stated,

> *"We don't often think about staff members and officers that transfer technology, not recognizing that part of the disparity in innovation is linked to technology officers not viewing inventions by women and minority as useful, compared to what they see and think when it's a male and a white male technology."*

It should be noted that one of the participants did not report encountering exclusionary or harmful day to day practices in academia and entrepreneurial spaces. Dr. S explained how she benefitted intellectually and career-wise from being situated in environments that recognized the importance of diversity. She commented,

> *"There are things that were different from when I came from my PhD, like I said, is that it was a much more diverse and highly interdisciplinary environment. So, I had to just develop new skills, especially in terms of how to work with people and people with different personalities, much larger groups."*

This learned understanding of the benefits of diversity would transfer over into Dr. S's research and entrepreneurial innovative pursuits. She remarked,

> "I think when you develop technologies, there are times when we might not think about some of the challenges it'll have after it's come up. But if you have people who have different backgrounds, they might actually be able to point out some of these things. Like, for example, we just talked about how some smartwatches, we hear about stories about how it works differently on people with different skin tone, and things like that. I mean, if you just simply had people who look different in that space, and they probably use the devices you will be or recruited individuals from their communities to participate in the studies, you will have data on these individuals, and they might be naturally interested in seeing how people who look like them also respond to some of these technologies."

Theme 2: Self-care and preservation is a motivator for Black women STEM faculty's STEM entrepreneurial education program decision making

The decision to pursue or not pursue a STEM EEP for each of the participants appeared to be connected to a personal ethos of self-care and preservation. Self-care can be defined as engaging in actions that prioritizes one's interests, development, motivation, and wellbeing, whereas self-preservation is the act of protecting oneself from harm. Participants who had not engaged in STEM EEPs discussed prioritizing self-care and preservation. One way this emerged is when some participants described how their familial, departmental and mentorship opportunities would have to be minimized before they pursued entrepreneurship. Dr. Sh stated,

> "And if I think five years down the future, three to five years down the future, what would that look like? The thing I'm most worried about is service. That I'm going to get asked to do a lot of service work, and that's going to compete with things like doing an incubator or [entrepreneurship education program] or something like that."

Additionally, some participants described not wanting to encounter additional instances of social exclusion. When asked what some of the reasons behind why women do not engage in entrepreneurship. Dr. J explained,

> "Why are we not engaged? It's just the same level of engagement as being an entrepreneur as the engagement with being in research. You are going to be left to fend for yourself, and so if I've been doing this in my research and it's the same script now to become an entrepreneur, I'm like, "I did that, I probably could do it, I have no interest in it because I'm tired."

Dr. J's comments indicate how Black women may perceive participating in STEM EEPs as introducing additional chances for exclusionary encounters and practices to occur.

Some participants decided to pursue STEM EEPs based on their extended community's investment in their self-care. Extended community members included students, children, and university technology officers. These participants discussed how they were motivated to

participate in STEM EEPs when a member of their extended community explained how STEM academic entrepreneurship aligned with their career interests. When Dr. Wu was asked why she participated in a STEM EEP, she noted,

> *"My research has always had the bench towards that application, even though there's a lot of fundamental work that I also do as well. But I've never really thought about actually taking technology to the market until my son said, "No, mommy, have you thought about..." I said, "Well, I could explore it. Let's explore it."*

Dr. Wu explains how her decision to pursue a STEM EEP was connected to her son explicitly outlining how the program would help to strengthen her career goals. Therefore, STEM EEPs may benefit from investing in identifying the self-interests and goals of Black women STEM faculty to increase their representation and participation.

Discussion, Conclusions, and Future Work
Over the past decade, STEM EEPs have expressed interest in broadening their program participation for those who belong to minoritized populations [25], [27], [65], [66]. These interests coincide with governmental pushes to expand the STEM workforce [1], [18] and increased understanding of how diversity contributes to groundbreaking scientific and technological innovation [2], [3]. By relying on Black women's ways of knowing, our findings illustrate how STEM EEPs' diversity initiatives must contend with how STEM higher education and entrepreneurial spaces (i.e., STEM EEPs, academic departments) are entrenched with interpersonal dynamics that contribute to Black women's marginalization. For example, some participants in this study discussed experiences with being excluded from research collaborations in their academic departments and universities. Some participants also discussed experiences with investors failing to see the value of their innovations. As a consequence, some participants described not wanting to engage in STEM EEPs to protect themselves from further marginalization. In contrast, our findings suggest this lack of interest in STEM EEPs is mitigated when Black women encounter individuals who connect the goals of STEM EEPs to their own self-interests. Therefore, STEM EEPs' diversity goals may be achieved by investing in recruitment practices that center the self-interests, goals, and care of Black women STEM faculty.

Our findings counter common reasonings behind a lack of diversity in STEM EEPs. Common understandings on minoritized populations' minimal engagement in STEM EEPs is often tied to 'leaky pipeline' issues in STEM [25], [28], [68]–[70] or a lack of interest from minoritized populations [71], [72]. Our findings offer a counter narrative by illustrating how for some Black women the decision to not participate in STEM EEPs is rooted in a resistance strategy of self-care and preservation [11], [61], [73], [74]. Prior work illustrates how Black women faculty are called to do 'invisible labor' in their academic departments such as disproportional teaching, service and mentoring loads that create roadblocks for obtaining higher professional positions or participating in extracurricular activities [67], [73], [75]–[79]. Because of this, participants in this study discussed how a reduction in these acts of 'invisible labor' would be necessary for them to participate in STEM EEPs. Additionally, prior research reveals Black women in STEM higher education report being dismissed by colleagues, faculty and peers which hinders their ability to access resources and social networks [80]–[82]. Some participants mentioned how their decision

to not participate in STEM EEPs is tied to the potential for additional social exclusion and harm. Audre Lorde, a Black feminist scholar notes, "Caring for myself is not self-indulgence, it is self-preservation and that is an act of political warfare" [85, p.130]. Therefore, the decision to not participate in STEM EEPs can be seen as a form of Black women's resistance to exclusionary interpersonal dynamics that appear in STEM higher education and entrepreneurial spaces [81], [83]–[86]. Future work should explore how STEM EEPs can mitigate exclusionary interactions towards Black women in programmatic structure, implementation, and outreach efforts.

Our findings also demonstrate the possibility for broadening the participation of Black women in STEM EEPs. Our findings highlight how Black women were more likely to participate in STEM EEPs when they interacted with someone who was able to connect the purpose of STEM EEPs to their interests and career goals. Throughout our interviews, we found that some of our participants mentioned how the interview offered them the chance to strengthen their entrepreneurial identity and decision-making. Our conversations suggest how STEM EEPs would benefit from more hands-on recruitment that centers on building community with Black women STEM faculty to understand how to align the interests and care of Black women with STEM EEP goals [11].

Historically, STEM innovation has benefited when STEM higher education spaces commit to broadening access towards minoritized groups [2], [3], [10]. However, our results suggest how broadening access is not enough to achieve diversity goals; rather, the future diversity of STEM EEP participation necessitates an active commitment to interrogate and reckon with how interpersonal dynamics in STEM higher education and entrepreneurial spaces have a pattern of hindering Black women from pursuing their STEM aspirations. Our findings highlight how Black women experience everyday practices of social marginalization and harm as they navigate STEM higher education and entrepreneurial spaces. On one hand, these exclusionary practices create barriers for Black women who wish to pursue STEM and entrepreneurship [80]–[82]. On the other hand, research suggests that these everyday racist and sexist encounters also adversely destroy Black women's psychological and physical wellbeing [41], [87], [88]. Thus, a meaningful investment in broadening STEM EEP participation will require identifying and disrupting the underlying mechanisms that contribute to these everyday exclusionary practices. Then, STEM higher education organizations can work towards working to repair past and present harms experienced by Black women in these spaces [89]. It is through these systemic changes we may see sustained and meaningful engagement of Black women in STEM EEPs and STEM entrepreneurship, resulting in continued advancements in local, national, and global STEM innovation.

References

[1] The President's Council of Advisors on Science and Technology, "Recommendations for Strengthening American Leadership in Industries of the Future," Washington DC, 2020. [Online]. Available: https://science.osti.gov/-/media/_/pdf/about/pcast/202006/PCAST_June_2020_Report.pdf?la=en&hash=019A4F17C79FDEE5005C51D3D6CAC81FB31E3ABC.

[2] B. Hofstra, V. V. Kulkarni, S. Munoz-Najar Galvez, B. He, D. Jurafsky, and D. A. McFarland, "The Diversity–Innovation Paradox in Science," *Proc. Natl. Acad. Sci.*, vol. 117, no. 17, pp. 9284–9291, Apr. 2020, doi: 10.1073/pnas.1915378117.

[3] K. W. Phillips, D. Medin, C. D. Lee, M. Bang, S. Bishop, and . N. Lee, "How Diversity Works," *Sci. Am.*, vol. 311, no. 4, pp. 42–47, Sep. 2014, doi: 10.1038/scientificamerican1014-42.

[4] T. T. Aldridge and D. Audretsch, "The Bayh-Dole Act and scientist entrepreneurship," *Res. Policy*, vol. 40, no. 8, pp. 1058–1067, Oct. 2011, doi: 10.1016/j.respol.2011.04.006.

[5] A. Huang-Saad, J. Fay, and L. Sheridan, "Closing the divide: accelerating technology commercialization by catalyzing the university entrepreneurial ecosystem with I-Corps™," *J. Technol. Transf.*, vol. 42, no. 6, pp. 1466–1486, Dec. 2017, doi: 10.1007/s10961-016-9531-2.

[6] C. C. Nnakwe, N. Cooch, and A. Huang-Saad, "Investing in Academic Technology Innovation and Entrepreneurship: Moving Beyond Research Funding through the NSF I-CORPS ™ Program," *Technol. Innov.*, vol. 19, no. 4, pp. 773–786, Jun. 2018, doi: 10.21300/19.4.2018.773.

[7] E. G. Carayannis, I. N. Dubina, and A. A. Ilinova, "Licensing in the Context of Entrepreneurial University Activity: an Empirical Evidence and a Theoretical Model," *J. Knowl. Econ.*, vol. 6, no. 1, pp. 1–12, Mar. 2015, doi: 10.1007/s13132-014-0234-3.

[8] F. Narin, K. S. Hamilton, and D. Olivastro, "The increasing linkage between U.S. technology and public science," *Res. Policy*, vol. 26, no. 3, pp. 317–330, Oct. 1997, doi: 10.1016/S0048-7333(97)00013-9.

[9] L. Robinson, "I-Corps and the Business of Great Science," *JOM*, vol. 64, no. 10, pp. 1132–1133, Oct. 2012, doi: 10.1007/s11837-012-0446-6.

[10] M. L. Shetterly, *Hidden figures: The untold story of the African-American women who helped win the space race*. New York, NY: Harper Collins, 2016.

[11] P. H. Collins, *Black feminist thought: Knowledge, consciousness, and the politics of empowerment*. Routledge, 2000.

[12] J. Jardim, A. Bártolo, and A. Pinho, "Towards a Global Entrepreneurial Culture: A Systematic Review of the Effectiveness of Entrepreneurship Education Programs," SOCIAL SCIENCES, preprint, Apr. 2021. doi: 10.20944/preprints202104.0432.v1.

[13] C. W. Barrow, *The Entrepreneurial Intellectual in the Corporate University*. New York: Springer International Publishing, 2018. doi: 10.1007/978-3-319-63052-6.

[14] J. V. Wellman, D. M. Desrochers, and C. M. Lenihan, "Trends in College Spending: Where Does the Money Come from? Where Does It Go? A Report of the Delta Cost Project.," Delta Project on Postsecondary Education Costs, Productivity and Accountability., 2009.

[15] A. Huang-Saad, C. Bodnar, and A. Carberry, "Examining Current Practice in Engineering Entrepreneurship Education," *Entrep. Educ. Pedagogy*, vol. 3, no. 1, pp. 4–13, Jan. 2020, doi: 10.1177/2515127419890828.

[16] J. W. Meyer and B. Rowan, "Institutionalized Organizations: Formal Structure as Myth and Ceremony," *Am. J. Sociol.*, vol. 83, no. 2, pp. 340–363, Sep. 1977, doi: 10.1086/226550.

[17] D. Klein, "A Brief History of American K-12 Mathematics Education," *Math. Cogn.*, pp. 175–225, 2003.

[18] D. A. Bell, "Brown v. Board of Education and the Interest-Convergence Dilemma," *Harv. Law Rev.*, vol. 93, no. 3, pp. 518–533, 1980, doi: 10.2307/1340546.

[19] A. A. Refaat, "The necessity of engineering entrepreneurship education for developing economies," *Int. J. Educ. Inf. Technol.*, vol. 3, no. 2, pp. 85–96, 2009.

[20] P. Weilerstein, "Guest Editorial: Entrepreneurship and Innovation in -Engineering Education," *Adv. Eng. Educ.*, vol. 5, no. 1, pp. 1–9, 2016.

[21] A. Epstein, N. Duval-Couetil, and A. Huang-Saad, "Gender differences in academic entrepreneurship: experience, attitudes and outcomes among NSF I-CORPS participants," *Int. J. Gend. Entrep.*, vol. 14, no. 1, pp. 117–141, Jan. 2021, doi: 10.1108/IJGE-10-2020-0166.

[22] L. Treanor, "Gender, STEM women and entrepreneurship: a review and future research directions," *Int. J. Gend. Entrep.*, vol. 14, no. 4, pp. 499–520, Jan. 2022, doi: 10.1108/IJGE-06-2022-0094.

[23] P. Shekhar, A.-H. Saad, A. Ostrawoski, and A. Ostrawoski, "Promoting Innovation by Women through Engineering Entrepreneurship Courses: An Assessment of Entrepreneurial Self-Efficacy," in *Proceedings of the Canadian Engineering Education Association (CEEA)*, Dec. 2018. doi: 10.24908/pceea.v0i0.12977.

[24] C. Morton, A. Huang-Saad, and J. Libarkin, "Entrepreneurship Education for Women in Engineering: A Systematic Review of Entrepreneurship Assessment Literature with a Focus on Gender," in *2016 ASEE Annual Conference & Exposition Proceedings*, New Orleans, Louisiana: ASEE Conferences, Jun. 2016, p. 26725. doi: 10.18260/p.26725.

[25] M. Benitez Jr., "Resituating culture centers within a social justice framework," in *Culture centers in higher education: Perspectives on identity, theory, and practice*, Sterling, Virginia: Stylus Publishing, LLC, 2010, pp. 119–134.

[26] J. Jackson, M. Pearson, A. Huang-Saad, and J.-L. Mondisa, "Innovating Innovation: Advancing Racial Equity in STEM Entrepreneurship Programming," *J. Women Minor. Sci. Eng.*, in press, doi: 10.1615/JWomenMinorScienEng.2022041287.

[27] J. Jackson, J. Gilbert-Sovern, and A. Huang-Saad, "Work in Progress: Examining Diversity, Equity, and Inclusion in Entrepreneurship Programming," presented at the 2022 ASEE Annual Conference & Exposition, 2022.

[28] E. O. McGee, "Interrogating Structural Racism in STEM Higher Education," *Educ. Res.*, vol. 49, no. 9, pp. 633–644, Dec. 2020, doi: 10.3102/0013189X20972718.

[29] B. J. Casad *et al.*, "Gender inequality in academia: Problems and solutions for women faculty in STEM," *J. Neurosci. Res.*, vol. 99, no. 1, pp. 13–23, 2021, doi: 10.1002/jnr.24631.

[30] R. J. Burke, "Women and minorities in STEM: A primer," in *Women and minorities in science, technology, engineering, and mathematics: Upping the numbers*, Edward Elgar Publishing, 2007. Accessed: Feb. 13, 2023. [Online]. Available: https://www.elgaronline.com/display/9781845428884.xml

[31] M. N. Miriti, "The Elephant in the Room: Race and STEM Diversity," *BioScience*, vol. 70, no. 3, pp. 237–242, Mar. 2020, doi: 10.1093/biosci/biz167.

[32] I. H. Settles, N. T. Buchanan, and K. Dotson, "Scrutinized but not recognized: (In)visibility and hypervisibility experiences of faculty of color," *J. Vocat. Behav.*, vol. 113, pp. 62–74, Aug. 2019, doi: 10.1016/j.jvb.2018.06.003.

[33] E. G. Teich *et al.*, "Citation inequity and gendered citation practices in contemporary physics," *Nat. Phys.*, vol. 18, no. 10, pp. 1161–1170, Oct. 2022, doi: 10.1038/s41567-022-01770-1.

[34] C. Y. Chen *et al.*, "Systemic racial disparities in funding rates at the National Science Foundation," *eLife*, vol. 11, p. e83071, Nov. 2022, doi: 10.7554/eLife.83071.

[35] D. K. Ginther *et al.*, "Race, ethnicity, and NIH research awards," *Science*, vol. 333, no. 6045, pp. 1015-1019., 2011.

[36] I. H. Settles, M. K. Jones, N. T. Buchanan, and K. Dotson, "Epistemic exclusion: Scholar(ly) devaluation that marginalizes faculty of color," *J. Divers. High. Educ.*, vol. 14, no. 4, pp. 493–507, 2021, doi: 10.1037/dhe0000174.

[37] K. Kuschel, K. Ettl, C. Díaz-García, and G. A. Alsos, "Stemming the gender gap in STEM entrepreneurship – insights into women's entrepreneurship in science, technology, engineering and mathematics," *Int. Entrep. Manag. J.*, vol. 16, no. 1, pp. 1–15, Mar. 2020, doi: 10.1007/s11365-020-00642-5.

[38] F. Beal, *Double Jeopardy: To Be Black and Female*. New York, New American Library: The Black woman: An anthology, 1970.

[39] S. M. Malcolm, P. Q. Hall, and J. W. Brown, "The Price of Being a Minority Woman in Science," presented at the American Association, 1976.

[40] M. Knight, "Race-ing, Classing and Gendering Racialized Women's Participation in Entrepreneurship," *Gend. Work Organ.*, vol. 23, no. 3, pp. 310–327, 2016, doi: 10.1111/gwao.12060.

[41] E. O. McGee and L. Bentley, "The troubled success of Black women in STEM," *Cogn. Instr.*, vol. 35, no. 4, pp. 265–289, 2017.

[42] L. J. Charleston, P. L. George, J. F. L. Jackson, J. Berhanu, and M. H. Amechi, "Navigating underrepresented STEM spaces: Experiences of Black women in U.S. computing science higher education programs who actualize success.," *J. Divers. High. Educ.*, vol. 7, no. 3, pp. 166–176, 2014, doi: 10.1037/a0036632.

[43] A. Lorde, *Sister Outsider*. New York: Ten Sped Press, 1984.

[44] bell hooks, *Ain't I A Woman: Black women and feminism*. Boston, MA: South End Press, 1981.

[45] A. Davis, *Women, Race & Class*. Vintage Books, 1981.

[46] D. K. King, "Multiple Jeopardy, Multiple Consciousness: The Context of a Black Feminist Ideology," *Signs J. Women Cult. Soc.*, vol. 14, no. 1, pp. 42–72, Oct. 1988, doi: 10.1086/494491.

[47] K. W. Crenshaw, "Demarginalizing the Intersection of Race and Sex: A Black Feminist Critique of Antidiscrimination Doctrine, Feminist Theory and Antiracist Politics," *Univ. Chic. Leg. Forum*, pp. 139–167, 1989.

[48] A. J. Cooper, *A Voice from the South*. 1988.

[49] C. R. Collective, "A Black Feminist Statement," 1977.

[50] K. Dotson, "Knowing in space: Three lessons from Black women's social theory," Michigan State University, East Lansing, 2013.

[51] bell hooks, *Feminist thoery: From margin to center*. Pluto Press, 2000.

[52] J. W. Creswell and C. N. Poth, *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications, 2016.

[53] C. Moustakas, *Phenomenological research methods*. Sage Publications, 1994.

[54] M. Van Manen, "Practicing phenomenological writing," *Phenomenol. Pedagogy*, pp. 36–69, 1984.

[55] M. Van Manen, *Phenomenology of Practice: Meaning-Giving Methods in Phenomenological Research and Writing*. Routledge, 2016.

[56] G. Salamon, "What's Critical about Critical Phenomenology?," *J. Crit. Phenomenol.*, vol. 1, no. 1, pp. 8–17, Jun. 2018, doi: 10.31608/PJCP.v1i1.2.

[57] E. Magri and P. McQueen, *Critical Phenomenology: An Introduction*. Cambridge: John Wiley and Sons, 2023.

[58] L. Guenther, "Six senses of critique for critical phenomenology," *Puncta J. Crit. Phenomenol.*, vol. 4, no. 2, pp. 5–23, 2021.

[59] F. Fanon, *Black skin, white masks*. New York, NY: Grove Press, 1967.

[60] S. Ahmed, *Queer Phenomenology: Orientations, Objects, Others*. Durham and London: Duke University Press, 2006.

[61] D. G. Solórzano and T. J. Yosso, "Critical race methodology: Counter-storytelling as an analytical framework for education research," *Qual. Inq.*, vol. 8, no. 1, pp. 23–44, 2002.

[62] C. Parker, S. Scott, and A. Geddes, "Snowball sampling," *Sage Res. Found.*, 2019.

[63] D. R. Thomas, "A general inductive approach for qualitative analysis," 2003.

[64] D. R. Thomas, "A general inductive approach for analyzing qualitative evaluation data," *Am. J. Eval.*, vol. 27, no. 2, pp. 237–246, 2006.

[65] S. Maloy, C. Pucher, M. Sedam, C. Womack, and S. Baxter, "Opening doors for diverse talent in biotechnology with the BIO I-Corps experience," *Nat. Biotechnol.*, vol. 38, no. 9, Art. no. 9, Sep. 2020, doi: 10.1038/s41587-020-0663-4.

[66] E. W. Padmore and M. J. McMahon, "Fostering Diversity and Inclusion in the National Heart, Lung, and Blood Institute's Small Business Program," *Ethn. Dis.*, vol. 29, no. Suppl 1, pp. 71–76, 2019, doi: 10.18865/ed.29.S1.71.

[67] A. K. Daniels, "Invisible Work*," *Soc. Probl.*, vol. 34, no. 5, pp. 403–415, Dec. 1987, doi: 10.2307/800538.

[68] J. Blickenstaff, "Women and science careers: leaky pipeline or gender filter?," *Gend. Educ.*, vol. 17, no. 4, pp. 369–386, 2005.

[69] L. Martin, L. Wright, Z. Beaven, and H. Matlay, "An unusual job for a woman? Female entrepreneurs in scientific, engineering and technology sectors," *Int. J. Entrep. Behav. Res.*, vol. 21, no. 4, pp. 539–556, Jan. 2015, doi: 10.1108/IJEBR-08-2011-0095.

[70] D. Polkowska, "Women Scientists in the Leaking Pipeline: Barriers to the Commercialisation of Scientific Knowledge by Women," *J. Technol. Manag. Amp Innov.*, vol. 8, no. 2, pp. 156–165, May 2013, doi: 10.4067/S0718-27242013000200013.

[71] R. K. Goel, D. Göktepe-Hultén, and R. Ram, "Academics' entrepreneurship propensities and gender differences," *J. Technol. Transf.*, vol. 40, no. 1, pp. 161–177, Feb. 2015, doi: 10.1007/s10961-014-9372-9.

[72] M. Ong, C. Wright, L. Espinosa, and G. Orfield, "Inside the Double Bind: A Synthesis of Empirical Research on Undergraduate and Graduate Women of Color in Science, Technology, Engineering, and Mathematics," *Harv. Educ. Rev.*, vol. 81, no. 2, pp. 172–209, Jun. 2011, doi: 10.17763/haer.81.2.t022245n7x4752v2.

[73] C. J. Porter, G. J. Boss, and T. J. Davis, "Just because it don't look heavy, don't mean it ain't: An intersectional analysis of Black women's labor as faculty during COVID," *Gend. Work Organ.*, vol. 30, no. 2, pp. 657–672, 2023, doi: 10.1111/gwao.12820.

[74] S. Y. Evans, *Black Women's Yoga History: Memoirs of Inner Peace*. State University of New York Press, 2021.

[75] A. Beeman, "'If Only We Are Brave Enough to Be It': Demanding More from Diversity, Equity, and Inclusion Efforts to Support Women Faculty of Color"," *Crit. Sociol.*, vol. 47, no. 7–8, pp. 1099–1109, Nov. 2021, doi: 10.1177/08969205211003316.

[76] D. A. Harley, "Maids of Academe: African American Women Faculty at Predominately White Institutions," *J. Afr. Am. Stud.*, vol. 12, no. 1, pp. 19–36, Mar. 2008, doi: 10.1007/s12111-007-9030-5.

[77] T. B. Blackshear and L. P. Hollis, "Despite the Place, Can't Escape Gender and Race," *Taboo J. Cult. Educ.*, vol. 20, no. 1, pp. 28–50, 2021.

[78] E. D. McCray, "Chapter 5 Woman(ist)s' Work: The Experiences of Black Women Scholars in Education at Predominantly White Institutions," in *Women of Color in Higher Education: Turbulent Past, Promising Future*, G. Jean-Marie and B. Lloyd-Jones, Eds., in Diversity in Higher Education, vol. 9. Emerald Group Publishing Limited, 2011, pp. 99–125. doi: 10.1108/S1479-3644(2011)0000009010.

[79] S. D. Garrett, M. S. Williams, and A. M. Carr, "Finding their way: Exploring the experiences of tenured Black women faculty," *J. Divers. High. Educ.*, Jul. 2022, doi: 10.1037/dhe0000213.

[80] N. T. Mertz, "Chapter 3 Women of color faculty: Recruitment, Hiring, and Retention," in *Women of Color in Higher Education: Changing Directions and New Perspectives*, G. Jean-Marie and B. Lloyd-Jones, Eds., in Diversity in Higher Education, vol. 10. Emerald Group Publishing Limited, 2011, pp. 41–71. doi: 10.1108/S1479-3644(2011)0000010007.

[81] L. Walkington, "How Far Have We Really Come? Black Women Faculty and Graduate Students' Experiences in Higher Education," *Humboldt J. Soc. Relat.*, vol. 39, pp. 51–65, 2017.

[82] I. H. Settles, M. K. Jones, N. T. Buchanan, and S. T. Brussel, "Epistemic exclusion of women faculty and faculty of color: Understanding scholar (ly) devaluation as a predictor of turnover intentions," *J. High. Educ.*, vol. 93, no. 1, pp. 31–55, 2022.

[83] A. Lorde, *A Burst of Light and Other Essays*. Mineola, New York: ixia Press, 2017.

[84] O. Adeeyo, *Self-Care for Black Women: 150 Ways to Radically Accept and Prioritize Your Mind, Body and Soul*. Stroughton, Massachussets: Simon and Schuster, INc., 2022.

[85] T. L. Henderson, A. G. Hunter, and G. J. Hildreth, "Outsiders within the Academy: Strategies for Resistance and Mentoring African American Women," *Mich. Fam. Rev.*, vol. 14, no. 1, 2010, doi: http://dx.doi.org/10.3998/mfr.4919087.0014.105.

[86] F. R. Aparicio, "Through my lens: A video project about women of color faculty at the University of Michigan Feminist Studies, 25(1), 119-130.," *Fem. Stud.*, vol. 25, no. 1, pp. 119–130, 1999.

[87] N. A. Corbin, W. A. Smith, and J. R. Garcia, "Trapped between justified anger and being the strong Black woman: Black college women coping with racial battle fatigue at historically and predominantly White institutions," *Int. J. Qual. Stud. Educ.*, vol. 31, no. 7, pp. 626–643, Aug. 2018, doi: 10.1080/09518398.2018.1468045.

[88] N. Rollock, "I would have become wallpaper had racism had its way": Black female professors, racial battle fatigue, and strategies for surviving higher education," *Peabody J. Educ.*, vol. 96, no. 2, pp. 206–217, 2021.

[89] K. Laymon, "What we owe and are owed: Kiese Laymon on Black revision, repayment, and renewal," *Vox*, May 17, 2021. Accessed: Feb. 28, 2023. [Online]. Available: https://www.vox.com/the-highlight/22419450/kiese-laymon-justice-fairness-black-america