

Nevertheless, She Persisted: Pathways of Resilience and Equity in Engineering Education

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ABSTRACT

This paper explores what persistence truly looks like when the systems built to include you were never designed with you in mind. Centering the lived experiences of women engineers from underrepresented racial and ethnic backgrounds, this research draws on narrative interviews with members of the National Society of Black Engineers, the Society of Hispanic Professional Engineers, and the Society of Women Engineers. Their stories reveal the tension between policy promises of inclusion and the daily realities of navigating bias, isolation, and the quiet erosion of DEI commitments within technical spaces.

Grounded in intersectionality and Black feminist theory, the study examines how racism, sexism, and institutional culture intersect to shape both the obstacles and the acts of defiance these women encounter. Through narrative analysis, their words uncover a shared pattern: persistence is not passive endurance - it's strategic resistance. Participants built communities of care, mentorship networks, and advocacy channels that allowed them to survive and reshape spaces that often sought to silence them.

This research calls for reframing persistence as a form of leadership - one that refuses to accept neutrality as progress. It highlights how culturally responsive networks, policy fluency, and collective accountability can transform engineering education and practice into places where belonging is not conditional. In doing so, it positions women's resilience as both an outcome and a method of change, illuminating what it takes to build equity into the core of engineering's future.

Keywords

intersectionality, women engineers, equity in STEM, persistence, resilience, transformative leadership

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METHODOLOGICAL NOTE

This article is based on the author's doctoral dissertation (McPherson, 2024). The research and participant quotes featured in this piece are taken from Chapter 5 of that dissertation, which details interviews with nine women engineers who are members of the National Society of Black Engineers (NSBE), the Society of Hispanic Professional Engineers (SHPE), and the Society of Women Engineers (SWE). The selection of participants from these organizations is intentional, as they represent key professional networks that play a significant role in the experiences and advocacy of women in engineering. References to "McPherson, 2024" within this article refer to Chapter 5 of the dissertation. The full dissertation includes the complete research methodology (Chapter 4), theoretical framework (Chapter 2), and all participant narratives (Chapter 5).

INTRODUCTION

For the past five decades, a critical question has persistently echoed through the engineering world: "Where are the women engineers?" Despite extensive efforts by government and industry, the engineering labor gap not only persists but grows, characterized by a profound

lack of diversity, equity, and inclusion in Science, Technology, Engineering, and Mathematics (STEM) fields. This pervasive issue is widely recognized as the "Leaky STEM Pipeline," a metaphor that illustrates the continuous attrition of underrepresented groups at various stages of their STEM journey due to barriers such as limited resources, discriminatory practices, and biased hiring (Calhoun et al., 2022; Cannady et al., 2014).

What is less often asked is what it actually takes to stay. Much of the engineering education literature focuses on why women leave, but far less attention is given to how some persist. Persistence is frequently treated as grit or resilience, something individual women are expected to bring with them, rather than a response to the conditions they encounter in classrooms, labs, and departments. Even fewer studies center the voices of underrepresented women engineers themselves, leaving educators with an incomplete picture of what persistence looks like in practice.

The statistics paint a stark picture: women of color comprise less than 2% of all engineering professionals, and women overall make up only about 15% of the engineering workforce, plummeting to as low as 8% in certain subdisciplines such as mechanical engineering (National Science Foundation (NSF), 2023). Crucially, the most significant gender disparity occurs postgraduation, with women being considerably more prone to leaving the STEM workforce by age 30 (Speer, 2023). This profound underrepresentation is not merely a matter of equity; it is a strategic imperative for national security and prosperity, as it stifles innovation and limits our collective problem-solving capacity (Alfred et al., 2019).

This paper starts from a different place. While the existence of the "Leaky STEM Pipeline" is well-documented, this study advances beyond quantitative measures to delve into the rich, lived experiences of women engineers. However, rather than framing these women solely as victims of systemic barriers, this research reveals a more complex reality: **persistence in engineering is not passive endurance; it is strategic resistance**. It is the set of deliberate choices, adaptations, and negotiations women make to remain in spaces that were not designed for their success.

By listening closely to these experiences, this study invites engineering educators to rethink how teaching practices, assessment norms, and institutional cultures shape who feels able to stay and who does not. If we want to grow and retain women in engineering, we must first understand what persistence actually costs, and who is paying that cost. Through narrative interviews with nine professional women engineers, this paper examines how women from underrepresented racial and ethnic backgrounds actively navigate, resist, and reshape engineering spaces that were not designed with them in mind ¹ (McPherson, 2024).

This research challenges conventional understandings of persistence and reframes it as a form of leadership, one that refuses to accept neutrality as progress. By centering the voices of women engineers themselves, this study illuminates the tension between policy promises of inclusion and the daily realities of navigating bias, isolation, and the quiet erosion of Diversity Equity & Inclusion (DEI) commitments within engineering workplaces.

THEORETICAL FRAMEWORK: INTERSECTIONALITY AND BLACK FEMINIST THEORY

This research is grounded in two complementary theoretical frameworks that provide essential lenses for understanding the experiences of underrepresented women in engineering: intersectionality theory and Black feminist theory.

Intersectionality theory, as advanced by Crenshaw (1989), recognizes that various dimensions of identity, including race, gender, class, and others, intersect and interact, leading to unique forms of privilege and oppression. For women engineers from diverse racial backgrounds, this framework is crucial for understanding how the convergence of racism and sexism shapes their career trajectories in ways that are qualitatively different from the experiences of either white women or men of color. The compounded effects of multiple forms of discrimination create distinct challenges that cannot be fully addressed by efforts that focus on gender or race alone (Corneille et al., 2019). As Clark-Blickenstaff (2005) argues, the pipeline metaphor overlooks the influence of cultural factors, such as biases and stereotypes, on women's decision-making processes and career trajectories, disregarding the impact of societal norms and expectations on women's experiences in STEM.

Black feminist theory, as articulated by scholars like Hooks (1984) and Butler (1990), provides a framework for critically examining power dynamics, gender inequalities, and structural barriers within male-dominated fields. This theory emphasizes the lived experiences of Black women and highlights how they create agency within oppressive systems through acts of resistance and defiance. Black feminist thought recognizes that marginalized women are not simply passive recipients of oppression but active agents who develop sophisticated strategies for survival and success (Ross et al., 2021).

Together, these frameworks illuminate how racism, sexism, and institutional culture intersect to shape both the obstacles and the acts of defiance that underrepresented women engineers often encounter. They provide the analytical tools necessary to understand persistence not as individual resilience alone, but as collective, strategic resistance, a form of leadership from the margins that actively works to reshape exclusionary systems.

METHODOLOGY

This qualitative study employed narrative analysis as its primary methodology, complemented by grounded theory and thematic analysis. Narrative analysis offers a comprehensive approach to exploring individuals' lived experiences, allowing researchers to gain insights beyond quantitative data and revealing the emotional, social, and psychological dimensions of discrimination (Riessman, 2008). By capturing and analyzing personal narratives, researchers can uncover underlying power dynamics and structural factors that contribute to systemic inequalities while understanding how these intersect with race, gender, and other social identities (Clandinin & Connelly, 2000).

PARTICIPANTS

Nine professional women engineers with extensive industry experience participated in this study. To protect anonymity and humanize the narratives, each participant is referred to by a pseudonym. Organizational affiliation (NSBE, SHPE, SWE) is noted only when analytically relevant as it provides crucial context for understanding the unique experiences, challenges, and support systems shaped by their involvement in these professional communities. This organizational context is crucial for two key reasons: it illuminates how participants navigated their engineering careers and how their experiences within these groups informed their perspectives on persistence and leadership, and it highlights how these organizations function as vital sites for strategic resistance and advocacy. For example, Sophia (SWE), highlighted the value of these connections: "Being part of SWE, going to the various DEI conferences that my company participates in lets you understand a little bit more about everyone's struggles. And how they're similar and how we can navigate those challenges together."

The participants included three Black women, three White women, one Hispanic woman, one Asian woman, and one Southeast Asian woman, representing diverse racial and ethnic backgrounds. All participants held engineering degrees and had worked or were currently working in the engineering industry, with experience ranging from 6-10 years to over 16 years in the field. Most participants (six out of nine) had over 16 years of professional experience, providing seasoned perspectives on career trajectories and workplace dynamics.

Women engineers who are professional members of NSBE, SHPE, and SWE were invited to participate through organizational channels. Seventy-five women responded to the recruitment request, completing an online questionnaire that collected demographic information, professional details, and initial reflections on challenges facing women in engineering. From this pool, nine women were selected for in-depth interviews based on organizational affiliation, years of experience, and engineering discipline, to capture diverse perspectives across the three organizations.

DATA COLLECTION

Semi-structured interviews were conducted via Zoom between spring and summer 2024, lasting approximately 60-90 minutes each. Interviews explored participants' motivations for entering engineering, challenges encountered, support systems utilized, and recommendations for improving women's participation and retention in the field. Questions addressed early influences, cultural pressures, workplace challenges, supportive factors, career development, and organizational recommendations. Interviews were recorded, transcribed using Zoom's transcription feature, and then carefully reviewed and corrected by the researcher. Transcripts were shared with participants for accuracy verification, ensuring their voices were represented authentically (McPherson, 2024).

DATA ANALYSIS

The analysis employed multiple complementary approaches to capture both individual narratives and cross-cutting themes. **Narrative analysis** treated each interview as a unique story, focusing on understanding individual journeys, challenges, and triumphs while identifying common threads across narratives (Riessman, 2008). Each participant's story was analyzed holistically to understand their trajectory from choosing engineering through their current career position, examining turning points, critical incidents, and strategies employed at different career stages.

Grounded theory (Glaser & Strauss, 1967) allowed for constant comparison and analysis, enabling themes to emerge directly from the data rather than from predetermined categories. Through iterative analysis, the researcher identified patterns and developed a theoretical understanding grounded in participants' experiences. **Thematic analysis** was conducted using an inductive approach, identifying patterns grounded in participants' own words and experiences without attempting to fit data into pre-existing frameworks (Braun & Clarke, 2006).

Critically, in vivo coding ensured participants' voices remained at the forefront by using their actual words as codes (Manning, 2017). This approach is particularly valuable in narrative analysis, as it centers meanings generated by participants themselves and validates the researcher's understanding of what is important to them. In vivo codes such as "You have to be better than everyone, better than your counterparts" and "I've felt, I mean, not felt. It's not only emotions, it's actually happened" captured the raw, authentic language participants used to describe their experiences.

TRUSTWORTHINESS AND TRIANGULATION

Methodological triangulation was employed by using multiple analytical approaches (narrative analysis, grounded theory, thematic analysis) and recruiting participants from three different professional organizations. Member checking was conducted by sharing transcripts and emerging findings with participants to ensure accuracy and authenticity. The researcher maintained a reflexive journal throughout data collection and analysis to document potential biases and ensure participants' voices remained central rather than the researcher's interpretations.

FINDINGS: UNPACKING STRATEGIC RESISTANCE THROUGH DETAILED NARRATIVES

The narratives shared by the nine women engineers revealed a complex landscape of challenges and triumphs. Rather than presenting only high-level themes, this section organizes empirical evidence using thematic headings and illustrative excerpts to show both individual experiences and shared patterns. The integrative work of connecting themes across participants is developed in the Discussion. Four interconnected dimensions of strategic resistance emerged from the analysis; each illustrated through participants' voices.

BUILT COMMUNITIES OF CARE

Faced with isolation and marginalization in male-dominated workplaces, participants actively sought and cultivated supportive networks both within and outside their organizations. Professional organizations, NSBE, SHPE, and SWE emerged as vital sources of community, resources, and belonging.

Alicia (SWE), an electrical engineer with over 16 years in the technology industry, articulated the validation these communities provide: "Groups like SWE help women engineers share problems and realize they are not alone, giving them hope and strategies to speak up for themselves at work". This was not simply emotional support but strategic knowledge-sharing that equipped women to navigate workplace challenges.

These communities functioned as counter-spaces where women could discuss shared challenges without judgment, exchange strategies for navigating bias, and find validation for experiences that were often dismissed or minimized in their workplaces. The importance of these networks extended beyond support to collective action; they provided platforms for women to organize, strategize, and amplify their voices in ways that would be impossible individually, transforming personal struggles into collective resistance.

MENTORSHIP NETWORKS AS STRATEGIC RESOURCES

Mentorship emerged as a critical form of strategic resistance, though participants emphasized important distinctions between mentorship and sponsorship. While mentors provided guidance and support, sponsors actively advocated for opportunities and advancement.

Camille (NSBE), a civil engineer in construction with over 16 years of experience, articulated a "two mentor approach" that addressed multiple dimensions of support needs: "Most of my mentors were male, but I will say that I always had a two-mentor approach. One was always a woman... she mentored me on how to be a woman and professional engineering part". This strategic diversification reflected participants' understanding that they needed both technical guidance (which male mentors could provide) and guidance on navigating gendered expectations and challenges (which women mentors understood from experience).

However, participants also identified critical gaps in mentorship structures. Brianna (NSBE) highlighted the need for "a continuum of mentorship at every career stage rather than just early on," suggesting that women be provided mentors "immediately when starting at a company". This recommendation emerged from her experience feeling isolated as the only woman on her team, where she "felt added pressure to perform well" and tried to "overprepare for meetings by taking extensive notes to establish credibility."

The strategic nature of mentorship as resistance lies in how participants actively sought, cultivated, and leveraged these relationships to navigate systems designed to exclude them, refusing to accept isolation as inevitable and instead deliberately building support structures.

ADVOCACY CHANNELS: INDIVIDUAL AND COLLECTIVE

Participants engaged in both individual and collective advocacy as forms of strategic resistance. The individual level required persistent self-advocacy despite systemic barriers, while the collective level involved organizational platforms for policy influence.

Individual Self-Advocacy

Women described "continuously proving themselves," tracking their own performance metrics, and learning to "sell themselves more" to overcome biased assumptions about their competence and commitment. Monique (NSBE and SWE), an aeronautical engineer with over 20 years in the DoD/aerospace industry, exemplified this strategic approach: "I tracked my own performance on my company's core values matrix to identify strengths and areas needing growth to share with my supervisors". This deliberate documentation served as both protection against bias and evidence for advancement opportunities.

Isabel (SHPE), a mechanical engineer in oil and gas with 11-15 years of experience, confronted both gender and pay discrimination: "I've felt, I mean, not felt. It's not only emotions, it's actually happened. A lot of times they would pick the male person, like I said, doing the same job as me, and I had more experience". Her response was strategic advocacy, documenting instances of pay disparity and discrimination to build cases for fair treatment.

Collective Advocacy

Beyond individual efforts, participants emphasized the vital role of professional organizations in advocacy that individual members could never accomplish alone. Monique (NSBE and SWE) articulated the long-term vision required for advocacy, drawing on her deep understanding of how these platforms can drive systemic change. Her insights, shaped by her engagement with NSBE and SWE, underscore the critical role these organizations play in advocating for their members: "advocacy takes consistent effort over long periods to create change," advising members to be "intentional and consistent in all diversity and inclusion efforts across all levels".

The power of collective advocacy became evident when participants discussed how their experiences within organizations like NSBE, SHPE, and SWE provided legitimacy and amplification for concerns often dismissed when raised individually. Through organizational platforms, women's experiences were documented, research was conducted, and policy recommendations were developed, transforming personal narratives into evidence for systemic change.

PERSONAL RESILIENCE AND ADAPTABILITY AS RESISTANCE

While structural and collective strategies were crucial, participants also emphasized individual strategies of resilience, continuous learning, and adaptability. Their narratives revealed that resilience was not passive acceptance but active resistance, a refusal to be pushed out despite systemic barriers.

Strategic Competence

Participants cultivated what might be termed "strategic competence," deliberately overpreparing, documenting work meticulously, and building technical expertise to counter assumptions of incompetence. Brianna (NSBE) explained: "As the only woman on my team, I felt added pressure to perform well and not let my manager down. I tried to overprepare for meetings by taking extensive notes to establish credibility". This extra labor was necessary because, as Camille (NSBE) stated, "You have to be better than everyone, better than your counterparts", a burden white male colleagues never had to bear.

Navigating Higher Standards

Participants were clear-eyed about unequal standards. Erin (SWE) noted that "women are generally held to higher standards and need more credentials compared to men to be promoted". She recounted "advising a woman coworker, who was debating getting an MBA, to pursue it if she wants to, saying she likely needs it more than a male manager would." This recognition of systemic inequity informed strategic decisions about credentialing and professional development.

Energy Management and Sustainability

Yet participants also recognized the costs of constant vigilance. Fatima (SWE) described achieving "good work-life balance with two young children" and feeling she had "earned the right to do things like attend her kids' school events during work hours". She "leads by example by taking vacations and sick days without feeling pressure to work" and encourages "her team to have balance as well," modeling sustainable approaches to resistance.

The Barriers That Necessitate Resistance

To fully understand these strategies of resistance, it is essential to acknowledge the barriers that made them necessary. Participants' narratives documented pervasive structural and individual barriers that created hostile, exhausting work environments.

Structural Barriers

Participants described a lack of representation, inequitable hiring and promotion practices, and the absence of supportive policies. Isabel (SHPE) stated bluntly: "A lot of times they would pick the male person, like I said, doing the same job as me, and I had more experience". This pattern of promoting less experienced men over more qualified women was documented across multiple participants' experiences.

Gender and Racial Biases

Individual barriers included pervasive gender and racial biases manifesting as discrimination and microaggressions. Alicia (SWE) faced "the perception that women engineers would eventually move into less technical roles like human resources or program management" and

experienced "questioning of her ability to focus on her career after starting a family". She overheard a male coworker complaining, "Why do we even hire women if they are just going to quit and be a stay-at-home mom?"

Being Mistaken for Support Staff

Multiple participants described being mistaken for secretaries or administrative staff. Isabel (SHPE) explained: "Many times, starting in the beginning of my career in engineering, especially in the oil and gas industry, a lot of people used to think I was a secretary because I was actually one of the very few women in the building besides the secretary". Camille (NSBE) recounted: "I started out being the second female in the building... and everybody thought I was a secretary. When I was in my orientation, a gentleman came to me and said, can you bring me a coffee?"

The cumulative effect of these barriers created what participants described as exhausting, isolating environments where belonging was constantly conditional, and success required extraordinary effort. Yet rather than accepting these conditions, participants developed sophisticated strategies of resistance, transforming their persistence into a form of leadership.

DISCUSSION: REFRAMING PERSISTENCE AS LEADERSHIP

The findings of this study reveal a fundamental insight: persistence in engineering for underrepresented women is not passive endurance but strategic resistance, and strategic resistance is a form of leadership.

This reframing has profound implications for how we understand both persistence and leadership in engineering contexts. Traditional narratives of persistence tend to emphasize individual grit, resilience, and determination, qualities located within individuals who must simply work harder or be tougher to succeed. These narratives inadvertently place the burden of change on marginalized individuals while leaving systemic barriers unexamined and unchallenged (Hunt, 2016; Singh et al., 2018).

In contrast, understanding persistence as strategic resistance illuminates several critical dimensions that have been overlooked in both research and practice. First, **strategic resistance is inherently collective rather than purely individual**. The communities of care, mentorship networks, and advocacy channels that participants built were not simply support systems but sites of organized resistance to exclusionary cultures. Through these collective structures, women shared knowledge about navigating bias, developed strategies for advancement, documented patterns of discrimination, and organized for systemic change. This collective dimension positions persistence as a form of community leadership that creates paths for others to follow.

Research on women's attrition from engineering has documented the importance of support networks (Buse et al., 2013; Fouad et al., 2017), but this study extends that understanding by revealing how these networks function as sites of strategic resistance. Participants did not simply receive support; they actively built communities that challenged and reshaped engineering cultures.

Second, **strategic resistance involves sophisticated analysis of power and systems**.

Participants demonstrated deep understanding of how bias operates in their workplaces, which policies and practices needed to change, and how to leverage organizational structures for advocacy. Their "policy fluency", understanding legal frameworks, organizational policies, and

mechanisms for change, enabled them to engage in targeted resistance. This analytical sophistication is a hallmark of leadership, yet it is rarely recognized as such when exercised by marginalized groups.

Third, **strategic resistance is transformative rather than adaptive**. Rather than simply adjusting to hostile environments, participants actively worked to reshape those environments through mentoring others, serving in leadership roles in professional organizations, advocating for policy changes, and modeling alternative ways of being in engineering. As Monique (NSBE and SWE) emphasized, "advocacy takes consistent effort over long periods to create change," a vision of leadership as sustained, intentional transformation rather than individual advancement.

This finding resonates with Ross et al (2021) research on "resilient engineering identity development" among Black women engineers, which emphasized how identity development is "critical to prolonged engagement." However, this study extends that work by explicitly framing these identity processes as forms of leadership rather than simply individual resilience.

Fourth, **strategic resistance refuses to accept neutrality as progress**. Participants were clear that superficial diversity initiatives, performative statements, and passive inclusion efforts were insufficient. They called for "greater accountability, transparency, and intentionality" in DEI efforts, emphasizing the need for "measurable goals and metrics" and "leadership buy-in". This demand for substantive rather than symbolic change reflects leadership that holds systems accountable rather than accepting incremental adjustments.

Contrasting with Traditional Leadership Models

Traditional leadership models in engineering tend to emphasize hierarchical authority, technical expertise, individual achievement, and command-and-control approaches (Amon, 2017). By these standards, leadership is something that happens at the top of organizations, exercised by those with formal positional power.

In contrast, the leadership embodied in strategic resistance is:

- Distributed and collective rather than hierarchical and individual
- Rooted in marginalized experiences rather than dominant perspectives
- Focused on systemic transformation rather than individual advancement
- Sustained through community rather than individual heroism
- Accountable to those most harmed rather than those most powerful

This form of leadership challenges engineering's traditional emphasis on "neutrality" and "meritocracy" by insisting that equity requires active intervention, not passive nondiscrimination. It positions women's resilience as both an outcome of their resistance and a method for creating change; survival strategies that simultaneously challenge and transform hostile environments.

Implications for Engineering Education and Practice

Reframing persistence as leadership has concrete implications for how engineering education and practice should be restructured.

For Educational Institutions

Rather than focusing solely on recruiting women into engineering, institutions must examine how their pedagogical approaches, curriculum content, and institutional cultures either support or undermine belonging. As participants suggested, "DEI should be embedded into the engineering curriculum" rather than treated as separate training. This includes examining whose knowledge is valued, which problems are considered worthy of engineering attention, and how collaboration and community are taught and assessed.

For Industry Organizations

Rather than implementing superficial diversity initiatives, organizations must undertake comprehensive cultural transformation. This includes confronting biases in hiring and promotion, creating genuine opportunities for advancement, providing flexible policies that support work-life integration, and ensuring that women in leadership positions are supported rather than set up to fail.

Alicia (SWE) recommended "providing flexibility and remote work options to support women engineers ages 35-50 who often leave the workforce while raising families". This addresses the documented pattern of women's attrition from STEM peaking around age 30 (Speer, 2023), when work-family conflicts intensify (Hunt, 2016; Singh et al., 2018).

For Professional Organizations

NSBE, SHPE, and SWE must continue strengthening their roles as sites of collective resistance while also examining their own practices. Participants called for more collaboration between organizations, greater focus on intersectional experiences, and sustained rather than episodic engagement with members throughout their careers. The power of these organizations lies not only in the resources they provide but in the collective spaces they create for organizing, strategizing, and advocacy. These organizations have been instrumental in advocacy efforts since their founding; SWE in 1950, NSBE in 1975, and SHPE in 1974, and continue to serve as vital platforms for collective resistance.

Leadership Training Reimagined

If persistence is leadership, then "leadership training" for women in engineering must be fundamentally reimagined. Rather than training women to better adapt to existing systems (through programs focused on negotiation, executive presence, or confidence-building), leadership development should:

- Validate and build on existing resistance strategies rather than treating women as lacking leadership skills
- Provide tools for collective organizing and advocacy rather than focusing solely on individual advancement
- Develop policy fluency and systems-change competencies rather than interpersonal skills alone
- Create spaces for women to name and analyze oppression rather than accepting neutrality

- Support sustainability and care rather than perpetuating cultures of overwork and burnout

This reimagined leadership training would recognize that underrepresented women in engineering are already leading, through their persistence, their community-building, their advocacy, and their refusal to accept exclusion as inevitable. The question is not how to develop their leadership but how to recognize, support, and amplify the leadership they are already exercising. Participants' narratives demonstrate sophisticated leadership competencies: Monique's (NSBE and SWE) systematic tracking of her performance against organizational values; Camille's (NSBE) strategic two-mentor approach addressing multiple needs; Danielle's (SWE) self-directed research on gender bias and women's advancement; Fatima's (SWE) modeling of work-life balance for her team. These are all forms of leadership; they simply do not conform to traditional hierarchical models.

LIMITATIONS AND FUTURE DIRECTIONS

This study's qualitative methodology and focus on nine participants from three professional organizations necessarily limit its generalizability. The participants who chose to be interviewed may have different experiences from those who did not respond or who are not members of professional organizations. Additionally, all participants had persisted in engineering to some degree; the experiences of women who left the field entirely are not captured here, though understanding their narratives would provide important insights into the limits of strategic resistance.

SAMPLE LIMITATIONS

While the study achieved racial and ethnic diversity (three Black women, three White women, one Hispanic woman, one Asian woman, one Southeast Asian woman), the sample size of nine precludes deep comparative analysis of how experiences differ across racial groups. Future research with larger samples could examine intersectional differences more systematically. Similarly, all participants worked in industry settings at predominantly white institutions; experiences at HBCUs, minority-serving institutions, or in academic rather than industry contexts may differ substantially.

METHODOLOGICAL LIMITATIONS

The researcher's positionality as a Black woman engineer and lifetime NSBE member shaped both the study design and the rapport established with participants. While this insider status facilitated trust and nuanced understanding, it also required ongoing reflexivity to examine assumptions and ensure participants' voices were centered rather than the researcher's interpretations. The use of member checking, sharing transcripts, and emerging findings with participants helped ensure authenticity, but the researcher's interpretation inevitably shapes qualitative analysis.

DIRECTIONS FOR FUTURE RESEARCH

Longitudinal studies following women throughout their careers would illuminate how strategies of resistance evolve over time and which strategies prove most sustainable and effective in different career stages and organizational contexts. The current study captured snapshots at particular career points, but understanding how resistance strategies develop and change over time would provide valuable insights.

Examination of costs associated with strategic resistance would illuminate the physical, emotional, and professional toll of constant vigilance and resistance. While this study highlights women's agency, it is crucial not to romanticize resistance or ignore its burdens. Participants described exhaustion from over-preparing, isolation from being "on an island," and the burden of higher standards, but systematic examination of health outcomes, burnout, and long-term sustainability would provide important insights.

Understanding the experiences and decision-making of women who left engineering would provide crucial insights into when and why resistance strategies fail or become unsustainable. Research on women's attrition from STEM has documented various factors (Hunt, 2016; Fouad et al., 2017; Ross & Godwin, 2015) but examining these experiences through the lens of strategic resistance could reveal how systemic barriers overwhelm even sophisticated resistance strategies.

CONCLUSION

This research reveals a fundamental truth: persistence in engineering for women from underrepresented racial and ethnic backgrounds is not passive endurance but strategic resistance, and strategic resistance is a form of leadership that has been systematically unrecognized and undervalued.

This analysis demonstrates how racism, sexism, and institutional culture intersect to shape both obstacles and opportunities for resistance. These theoretical frameworks illuminate persistence as something that happens not despite systems of oppression but in active confrontation with them; a form of leadership from the margins that refuses to accept neutrality as progress.

Yet we must not romanticize this resistance or allow it to become an expectation rather than a recognition. The fact that women must engage in strategic resistance to persist in engineering is itself evidence of systemic failure. As participants' narratives reveal, being mistaken for secretaries, having their competence questioned, facing racist microaggressions, being passed over for less experienced men, and hearing colleagues question why women are even hired, the barriers remain pervasive and exhausting.

The goal is not to celebrate women's extraordinary efforts **but to transform systems so that such extraordinary efforts are no longer necessary**; to build equity into the core of engineering's future so that belonging is no longer conditional. This requires recognizing the leadership already being exercised by underrepresented women, supporting and amplifying that leadership, and fundamentally restructuring engineering education, practice, and culture. That is what it takes to build equity into engineering's future. And that is what we must recognize, support, and amplify if we are serious about creating engineering spaces where everyone can truly belong.

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¹All participant narratives, quotes, and analytical findings presented in this article are drawn from Chapter 5: Findings & Analysis of the author's doctoral dissertation (McPherson, 2024). The nine participants included engineers from diverse backgrounds: three White women, three Black women, one Hispanic woman, one Asian woman, and one Southeast Asian woman, representing disciplines including electrical, mechanical, civil, industrial, aeronautical, and supply chain engineering across industries such as technology, energy, construction, automotive, aerospace, and manufacturing.