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”I cannot relate”: The Importance Socioeconomic Status in the Journeys of Women of Color in Academia (Research)

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Abstract

This research explores the intersectionality of social class or the socioeconomic conditions under which an individual was raised with other marginalized identities in the journeys of women in STEM academia. The issue of social class in the academic experiences of women of color in STEM has not been robustly explored. The theoretical frameworks of the research included hidden curriculum, funds of knowledge, and intersectionality. Situated within a larger study, six among 13 women who participated in counterstories interviews revealed that they were first-generation students and/or were raised in low-income settings. Three of those women were more explicit in describing how socioeconomic issues impacted their experiences in STEM fields in higher education. Detailed narratives in the paper provide a rich, first-person perspective on their experiences. Positives included their ability to understand and help marginalized students navigate academia. Their background was also an asset when conducting research in partnership with communities in truly collaborative ways that resulted in community benefits. The journeys of these women in academia also included poignant stories of their struggles with people and systems with little understanding of the challenges they were facing. Issues previously reported in the literature around the hazards of being overburdened with service and the importance of mentoring are reinforced. The importance of first-generation status or low-income upbringing for women in STEM fields deserves further attention in engineering education.

Introduction

The underrepresentation of female faculty of color in STEM programs has been well documented, including challenges related to cultural issues, adversarial individuals, and structures in education and academia [1], [2]. An intersecting challenge is that many women of color are drawn to community engaged research (CER). CER is a research methodology that holds the promise of addressing critical environmental and public health challenges. However, some claim that CER lacks evidentiary rigor [3] and STEM faculty with scholarship rooted in CER may be at a disadvantage due to undervaluing of their research [4], [5]. These issues frame a National Science Foundation (NSF) ADVANCE SPACES grant. As one part of the larger effort, a member of the leadership team conducted interviews with 13 women holding doctorate degrees in STEM disciplines. A theme that emerged was the herculean barriers that must be surmounted in order to advance in academia by women of color who are the first in their families to earn graduate degrees and/or come from working-class or low-income backgrounds.

Colleges and universities are beginning to receive “first-generation” designations by providing scaffolding to help first-generation college students succeed [6], [7]. What would scaffolding look like for first-generation STEM female faculty of color who come from working-class backgrounds? Few publications address interventions related to socio-economic background [8]. Our study adds nuance to the discussion regarding classism within academia by centering race/ethnicity, gender, and the STEM disciplines. Our study poses the research question: What are the challenges facing first-generation women of color in academic STEM programs who seek to advance in their respective fields? We situate this study within the frameworks of intersectionality, hidden curriculum, and funds of knowledge.

Background

There are many descriptions of class, which is similar to caste:

> A caste system is an artificial construction, a fixed and embedded ranking of human value that sets the presumed supremacy of one group against the presumed inferiority of other groups on the basis of ancestry and often immutable traits, traits that would be neutral in the abstract but are ascribed life-and-death meaning. [9, pages 22-23]

While caste is a rigid construction, class is more fluid. Donaldo Macedo asserts that all forms of oppression must take a detour through a social class analysis [10]. Pierre Bourdieu developed a theoretical framework relevant to how social class operates in society [11]. He defines economic capital in terms of: material assets like bank accounts and real estate; cultural capital which concerns educational experiences and verbal skills; social capital which translates into access to social networks; and symbolic capital which represents honors and prestige. It is the constellation of the various forms of capital which determines one's position in the social hierarchy. Bourdieu defines habitus as how class gets under the skin. This includes speech patterns, dress, and gait, among other things. "When people lack the capital required to successfully navigate a social field, they are marginalized …" [12, pg. 371].

Heffernan acknowledges the challenges posed by social class within academia and the extra work needed to surmount these barriers [13]. He argues that academics from working class backgrounds lack (1) the intellectual benefits associated with attending prestigious schools; (2) access to a broad range of funding opportunities and influential networks; and (3) the flexibility to gift their time to projects offering little compensation. Based on interviews with 46 faculty from low-socioeconomic-status backgrounds, Lee [14] concluded that elite perspectives and experiences are normalized on university campuses. Further, faculty from affluent backgrounds privileged abstract knowledge over lived experience and refused to consider class as a meaningful source of inequality in academic life. This is consistent with Aldridge et al. [15] who claimed that academic institutional social norms are rooted in upper-class elite culture.

Morgan et al. [16] studied the role of faculty's childhood socioeconomic status, revealing "that the professoriate is, and has remained, accessible disproportionately to the socioeconomically privileged, which is likely to deeply shape their scholarship and their reproduction." Across all professors in their sample, 19.2% of the faculty had a parents' highest education of high school or less, compared to 25.2% among doctoral degree recipients and 54.8% of the U.S. population. Their model found that the current institutional prestige of faculty was predicted by the estimated average income of their family growing up and parents' highest degree / education level. Relatedly, Clauset et al. [17] found that "faculty hiring follows a common and steeply hierarchical structure that reflects profound social inequality." Among 19,000 faculty in computer science, business, and history, 25% of the institutions produced 71-86% of all tenure-track faculty, with indications that the institutional prestige associated with where someone earned their PhD was highly significant. Children from affluent backgrounds attend the most prestigious academic institutions in outsized numbers so the fact that the pedigree of the doctoral granting institution and department (as opposed to scholarly productivity) is a better predictor on where a recent doctoral recipient will be hired speaks volumes [18].

Previous research has explored the role of social class in the experiences of academics. In many of these studies, this is framed as "working class" (in contrast to middle class or upper class).

Many female faculty from working-class backgrounds feel imposterhood, shame, a lack of confidence, and embarrassment [19], [20]. Arner [18] used Bourdieu's concept of the body habitus to explain why the bodies of working-class female faculty undermine their performances as academics. An entire book explores how class impacts research, teaching, and service activities in humanities and social science disciplines [21]; engineering is not mentioned. McGee's study exploring women tenure-track faculty in engineering through the intersections of gender, race, and class [22] reported little specifics about class effects [23], [24].

Unfortunately, the lack of socioeconomic diversity of experiences among faculty likely results in a deficit of innovation. While the diversity-innovation paradox in science [25] has only been demonstrated for gender and racial minorities, a similar effect might be found with social class minorities. Luczaj [26] considers social class as a blessing in disguise. He asserts that academics from working-class backgrounds possess four unique assets: navigational capital, revolutionary potential, wisdom, and a distinct working-class pedagogy. This asset-based notion pushes back against prevailing studies that focus on the deficits of individuals from low-income backgrounds.

While much has been written about how female faculty experience the white patriarchal culture of academic STEM programs, little has been reported about the experiences of female STEM faculty from working-class backgrounds. We know even less about STEM female faculty coming from working-class backgrounds and identifying as people of color. This paper attempts to shed light in this area.

Conceptual Frameworks

Our conceptual framework is underpinned by the hidden curriculum and funds of knowledge theories with intersectionality to elevate systems-driven implications.

Hidden curriculum. Villanueva et al. write "Within educational and professional environments and settings, individuals don't just learn 'what is formally being presented . . . but also accumulate other hidden lessons in the process' [27, p. 1550]. The hidden curriculum in engineering is likely a significant factor in enculturating and socializing people into the meritocratic, hegemonic, and masculine norms of engineering [27]. Hidden curriculum during graduate education is receiving increasing attention [28], [29] and might be significant in women's persistence and post gradation career choices. While there is no formal curriculum for STEM faculty, hidden curriculum is a relevant framework to explore the spoken and unspoken rules around how one achieves tenure and promotion [30], [31]. The hidden curriculum or real secrets to success may contradict stated aims when faculty are hired (e.g., your job is 40% teaching, 40% research, and 20% service, but tenure rests on research) and annual evaluation criteria. This qualitative study will help to excavate the "unwritten, unofficial, and often unintended, assumptions, lessons, values, beliefs, attitudes, and perspectives that are not openly acknowledged" [27, p. 1549] and are unique to an institution from the vantage point of women of color in STEM who identify as first-generation and come from working-class backgrounds.

Funds of Knowledge (FoK) is a framework that pushes back on deficit framing of minority and working-class persons, asserting that one's upbringing can provide an array of cognitive, cultural, and social resources that one can draw upon to be successful in an array of settings [33], [34]. The asset-based FoK ideas have been used to explore how children can successfully navigate school and the journeys of first-generation students in college. Peraza [35] used a FoK framework in combination with social capital theory to ground a qualitative study of the

experiences of 13 first-generation graduate students of color attending a public Hispanic-Serving Institution. Ethnicity/race, gender, and social class were important in how the students mobilized their FoK as social and cultural capital. They also found many instances where the institution did not recognize students' FoK. Previous studies have also applied the FoK framework among community college faculty [36] and Latino/Latina social science faculty [37]. Agrawal [38] used a FoK lens exploring interviews with 8 Latina faculty (4 tenured, 4 tenure-track), 1 in 'hard sciences' and 7 in social sciences / humanities. Other studies applying a FoK framework to the experiences of STEM faculty were not found.

Intersectionality. Crenshaw's theory of intersectionality [39] considers structures of power and oppression along multiple axes. Crenshaw states, "It's not simply that there's a race problem here, a gender problem here, and a class or LGBTQ problem there. … what happens to people who are subject to all of these things" [40]. Indeed, first-generation women of color in academic STEM positions who come from working-class backgrounds face racism, classism, and sexism at the micro, meso, and macro levels [41], [42], [43].

Methods

This research is embedded within a larger study that is exploring how best to support women faculty of color in STEM. This portion of the study was gathering counterstories [44] to reveal the lived experiences of these women (University of Colorado Boulder IRB Protocol 23-0344). The larger ADVANCE SPACES team which includes women and men from a diversity of identities reviewed the interview questions. To date, 13 semi-structured interviews have been conducted with women holding doctoral degrees in STEM. The goal of the interviews was to learn about supports, obstacles, successes and challenges on their journeys through academia and associated with community engaged research. A few of the interviewees spontaneously shared stories related to their unique experiences associated with their upbringing, including poverty and being the first in their family to attend college. This research paper shares those stories.

To carefully protect the identity of the participants, only composite demographics of the group are reported. All of the 13 women had received their PhD in a STEM field from a university located in the U.S. The STEM fields represented included biology, civil engineering, environmental engineering, environmental science, industrial engineering, and public health. A variety of ranks within academia were represented (tenured professor, tenured associate professor, non-tenured associate professor, assistant professor, research professor, post-doctoral researcher, lecturer, adjunct faculty; administrative roles in their departments, colleges, and universities). Some were outside academia (e.g., working for the government). The types of institutions described by the participants in their graduate studies and academic positions included public and private institutions in the U.S.; R1, R2, and Master's institutions; Hispanic Serving Institutions, Historically Black Colleges and Universities (HBCUs), and Predominantly White Institutions (PWIs); institutions that had received the Community Engagement Carnegie classification. The race / ethnicity / nationality identifiers associated with the participants included Black, Southeast Asian / Vietnamese American, Latina, Chicana, Indigenous, Mexican, Indian, Chinese, Jewish, and White. Six among the 13 individuals mentioned having a low-income upbringing and/or being a first-generation college student.

To do justice in representing these stories, long portions of individual interviews are included. This method of presenting the results is consistent with the counterstory methodology. Many of these narratives were uninterrupted by the interviewer, resulting from a single open-ended

prompt. Clean verbatim quotes that were lightly edited to remove hesitations and fillers (e.g., like, so) are provided. In many cases portions of their words are omitted to retain the flow of the story and preserve anonymity, indicated by ellipses or words inserted in brackets. The authors added bold to draw the reader's attention to particular statements in the quotes. The results in this paper include brief excerpts from three interviews and longer stories from three interviews.

Limitations and Positionality

The socioeconomic status or being a first-generation student was not mentioned when recruiting women to participate in the interviews. Questions were not directly asked during the interviews about the socioeconomics of one's upbringing. Thus, these experiences and identities of participants may not have been revealed. Any stories that did emerge on these topics are therefore presumed to be of particular significance to the participants.

The first author sent the emails to recruit women to participate in the interviews for the study and conducted the interviews. I am a white woman, full professor in a STEM field. I do not come from an affluent background, although this is not generally known. I paid my own way through college, worked long hours throughout my degrees to fund my education, and was very frugal, often passing up social activities due to a lack of funds compared to my peers. The perceptions of the interviewees regarding the socioeconomic background of the interviewer likely influenced the stories that the participants chose to share. Appearing as a white woman of privilege may had led some women invited to participate in the interviews to decline to participate or self-censor their stories. Lacking cultural intuition, my experiences likely impacted my responses or follow-up questions during the interviews, as well as what elements in the stories resonate.

The second author is an African American cisgender female physician who comes from an upper middle-class background. She acknowledges the privilege associated with her position. She is also the daughter of a civil rights activist. Nevertheless, she is aware that her social location may influence how she interprets data. She is committed to actively reflecting on her biases throughout the research process to ensure that she interrogates systems of oppression and brings a nuanced understanding of the participant's perspectives.

Results and Discussion

Key ideas that emerged from the interviews with the women of color from low-income backgrounds are summarized in Table 1. The following sections elaborate on these ideas.

Key Idea	Elaboration
Funds of Knowledge	Lived experiences enable them to relate to low-income communities which is beneficial for their CER Lived experiences help them be better mentors for students from similar backgrounds
Hidden curriculum	Figuring out how to navigate systems not set up for low-income students or first-generation researchers
Intersectionality	Others making assumptions based on appearance that they are similar to other minoritized women Feel alone, unseen, don't belong, need to change to fit in Subject to multiple forms of discrimination, hardships, and stresses
Stress	Financial stress, often working multiple jobs during college Feeling less prepared academically based on public schooling, erodes confidence
Service burden	Institution using them as 'DEI show' Overloaded with committees to 'represent' diversity, advocate for students given their insights

Key Idea	Elaboration
Mentoring	Taking on mentoring students informally Lack role models or mentors from similar intersectional backgrounds
Facing disrespect	Individual colleagues subject them to microaggressions, racism Colleagues who don't respect them, may not understand or respect CER

In response to the question about how her unique multiple identities have been assets in academia, a researcher discussed how her background was motivating and useful in her community engaged research. Her background was a basis for forming trusting relationships and engaging in respectful ways that shared power with her community partners:

> I think, for my [community engaged] research it has been **an asset**. I'm from [a community where] we experienced a lot of socio environmental stressors in our lives [due to location] and our dynamics with the [government]. **I didn't grow up in an affluent household**. And growing up I was able to see the impacts of [government] practices on the [community] and policy…. [I became motivated to conduct research] that actually can help communities…. So I came here to do research …. [to understand issues that are] typically influencing **disproportionately vulnerable communities**. And I feel like I was [from] one of those [communities] back home. So I do identify. I know that I have a background and an understanding of how the system works that allows me to communicate and inform these communities to increase awareness. … **I feel like [community members] feel comfortable talking to me**. …. The way that I'm engaging is very participatory and bi-directional. …. I'm really looking forward to starting more projects back [near my home community]…. I don't think I care if [the department] doesn't like it because I really want to do this. And I think it's important. And I think the funding agencies see the value in it and the amount of information that I'm getting. … I'm restructuring my proposals in a way that I'm giving space for the community to decide some of the research questions. … I wanna get my tenure. But I think I'm gonna get it. I think they'll see it **eventually** that the value is in there.

The story above reveals assets and funds of knowledge that this minoritized female assistant professor brings to her work. But it also reveals some concern about her path to earning tenure based on her community engaged research.

An experienced researcher in CER, one of the women did not discuss personal socio-economic issues to a significant extent in her interview. There were small indications of her personal background:

> My culture … no matter how poor we are…. I was not born into a family of professors. …[but] my grandmother with 3 years of education was smarter than a lot of these people….
>
> … Working with people involves a whole set of tools that are not engineering tools. And there are people in engineering who claim that they can do this without the tools. … without knowing the community, without valuing them, **without ever being disadvantaged, always being privileged**.

She believed that CER should be led by scientists with a background in common with the community. She spoke of her upbringing, culture, and religious faith as being significant assets and supports on her journey in academia. Staying true to herself was more important than acquiring wealth or prestige in academia, pursuits that she found empty. From the start she majored in engineering to help communities like her own. She was strongly confident of her

abilities and persisted despite many obstacles that both individuals and the structure of academia put in her path.

Another interviewee mentioned being low-income or not 'affluent' during her upbringing rather in passing. In the example below the interviewee shares the nuances of different demographic identifications, such as the differences in Asian countries when considering being underrepresented.

> I have a lot more **invisible service**, because I have a generally pretty recognizable last name. There's only so many Vietnamese last names, right? So I've gotten lots of students from, not even in my school, just like all over the university, who email me. … it's nice in the sense that **I can serve as a role model for first gen students, for underrepresented students, for low-income students**. And I think that I add definitely a different perspective and voice to my departments and my schools, which they actually, I found out, **don't actually like**.
>
> A lot of institutions … don't segregate the data, and they lump together Asians and Asian Americans. But Asian faculty who are international, who are largely more from **affluent** countries like Asia, Korea, Japan, or even South Asia and India are highly overrepresented in Academia. And therefore they say all Asian and Asian Americans are overrepresented in Academia. Which is not the case at all. But at the same time … obviously on the scale of minority oppression I would say I experience the lesser end. I get **micro aggressions** all the time about like how young I look, my age, being a woman, right? You know my last institution kind of used me as their **DEI show**, because I was the first woman and minority on the tenure track in a decade, but not really supporting my research and just **giving me a ton of service** and a ton of curriculum development.

This brief excerpt alludes to challenges around different intersectional identities. Faculty in academia are stereotyped in many ways. She faced various microaggressions because of these identities and like other women and minority faculty was over-burdened with service and felt used as a "DEI show" by an institution. She did not discuss specific challenges or differences in how she was treated based on her class.

The paper now transitions into three longer stories from women who participated in the interviews.

Extended Story 1

An interviewee shared her experiences during her graduate studies and thoughts about joining academia as a professor. She did not discuss a lot about class or socioeconomic status, but those elements were present. In part of her story about her doctoral studies she shared an anecdote about visible and invisible differences, discussing the intersectional identities of race/ethnicity, nationality, and income level.

> Everyone in my lab at the time when I entered was very white presenting. So I come in with like my … curly and big… hair down, and because of my name -- and my parents did it on purpose to have a very Anglo name -- and my lab mates (which I'm still close with, I still call them friends), but I don't think they realized it was problematic for them to say that they were like, 'oh, I thought you were gonna be blonde hair and blue eyed based off your name.' And I was like Okay, cool. Well, I'm not. This is me.

…. Some of [the people in my lab, not my faculty advisor] had **internalized racism** where one can present as a minority. But they themselves, being international, don't identify as a minority. Because in the United States if you're international, you kinda automatically have minority [status] but when you go to their country they're actually the majority or the **rich types**. …. This person was also a minority Hispanic person but in their country they would be considered white.

She discussed her own financial struggles.

There are a lot of people in academia who only did maybe a quarter of the struggle to get to where they're at. And so that was one thing that I explained to my main advisor who's a white presenting man. I said that minority students, we're basically burnt out by the time we get to our PhD. **I had 4 jobs in my undergrad**. Two in my master's, and so just to get through those things, you know. And I knew a lot of people who had none, zero, zip! They got literally an allowance from their parents.

In terms of financial issues she discussed the 'dark side' of STEM academia where some departments seem to have standard practices not set up to ensure learning and academic excellence but rather to maintain a system of exploitation. Learning to navigate the hidden curriculum of real rules and policies versus what was typically done had financial implications.

…. I was like literally scraping money together…. a lot of it is the reality of minority women and minority people to get to the higher ed PhD levels there's a lot of **financial strain** involved in that….

I was working in a pretty large lab where it's kind of like, for a lack of better words, like a pyramid scheme. …. At least my university experience out here is that they want to keep the students longer, which is like also a red flag, cause they just wanna keep them to have them working in the lab at a **really low** [pay] **rate**. … I just had to … keep pushing forward really and not take what someone tells me as truth all the time. And I think that actually helped save me not being stuck for a long time….

Understanding those, I don't know, like **hidden truths** really to academia. That minority people, I strongly believe, aren't privy to those unless they had someone in their family who also recently went through Academia and higher ed.

She discussed the assets for folks with a low-income background conducting community engaged research, but also cautions that sometimes graduate students were exploited in these roles:

[We have] sensitivity on relationship making and then putting in enough time to build those relationships. …. I know some people who use their own money to go out and relationship build. And that's not fair because… the graduate student's getting **paid under the poverty line**. They just have the heart to go out and build those relationships. They're also the face of the project most of the time….

As the interview was concluding, she was asked to reflect on advice she would give to others. She discussed things that advisors should know. And also challenges that she recognized which turn some women of color away from staying in academia after earning their PhD.

I think … for advisors that are bringing on minority women is to know that… [it's not] like

> we're walking through a meadow of daisies and roses to get through to our PhD. There are a lot of things that are outlying that affect the energy that we can bring to the PhD. And our confidence as well. To not see too many minority women, still being not really represented. Maybe represented, but how many are actually fully tenured? …. Because they're saying, well, there's minority women professors here, and like, Yeah, they are. But how many are tenured? How many aren't stressed on just being put on the chopping block? How many have made it to the top and just can relax for a bit? ….
>
> And it's also that **reoccurring trauma**. …. I know that there's different types of trauma. But where it's that stress that's put on to minority women and professorships can bleed into [students]. [Because] minority students gravitate towards minority professors. ….
>
> … For minority women who are getting into professorship, … they'll be used as a poster child again. They'll be asked to join a **hundred different committees** because of their **racial insight**, basically. And how do you **say no** while you're still trying to climb the ladder? ….
>
> [For myself] seeing other minority women professors … a lot of them swim, and they're doing great things. But I know, internally they're drowning. And so that was a question for me is, do I really want that for my life? Do I want to continue this stress?

Similar to other interviewees, she was aware that minoritized women faculty are often overburdened with service which adds strain to their path to tenure. Her eyes were open to various challenges which made her hesitant to become a professor herself.

Extended Story 2

One interviewee was a woman of color who had been highly successful in academia, earning tenure and serving as a leader in multiple administrative roles. About halfway through the interview in response to the question "do you have some experiences where you felt like your identity was supported and celebrated in academia?" she mentioned the socio-economic conditions of her upbringing.

> I think that my identity is constantly supported by the students. I just hosted a first year experience. …. And I was like. 'Hi, my name is Dr. [XX]. Like a lot of you in this room, **I'm a first-generation student**.' And I kind of go through who I am, where I'm from. My parents make $19,000 a year. I was on full financial aid. I worked during school. .... And then the students started to turn, and their attention started to turn to me.
>
> And my colleague, he made a comment. He's like "it's so powerful when you start talking about yourself, because everybody relates, like everybody in the room, grabs something about you." And **that is where I feel celebrated. That is where I feel like me being me is appreciated because I don't have to fake who I am, and I don't have to hide who I am**. I don't think I've ever shared with my colleagues how much my parents make, because I don't think it's any of their business. But with students I'm like, Hello, full financial aid. Yeah, me, too, right on. I can navigate that with you. I know how to do that.

She was clearly an asset in helping students with financial challenges navigate academia. She could reveal the hidden curriculum of higher education to them. But she had faced challenges as a faculty member with multiple marginalized identities.

> When I started as a junior faculty, **I was the first female, first US-born faculty of color** in

> my department. And no one would believe me when I would say things like **I'm treated differently here**, that I'm not seen the way you are. And no one believed me, no one. And I essentially had to change who I was to my core to essentially earn respect from my colleagues, from administration, and from the students. And by that I mean, I'm a pretty friendly, outgoing, welcoming person. But if I am those things, I am a pushover. I am taken advantage of. I am too nice, and no one believes me or respects me, and I was constantly being mansplained. And you know it was **very frustrating** to be in that space. …. It's like I fought so hard to be recognized in my discipline for so many years as a Ph. D. student, and then I have to fight so hard to be recognized as an equal as a professor. And now 9 years later, I'm fighting so hard to be recognized as an equal, as a respectable member of administration. … and **it's the same struggle over and over again**.

She describes challenges with being a woman of color but does not specifically discuss whether being from a low-income background was an additional burden. She went on to discuss her motivation for being in academia:

> …. I don't know what it was about me that made me stay, because I knew I could make more money and I wouldn't have to deal with all of this nonsense if I went to a professional field. Because I'm an engineer ….. I could have been making 60 or 50k more than what I was making when I started [as an assistant professor]. And so I'm like, why did I stay? And then it goes back to **my core values** of I love teaching. I love interacting with students. I love changing their lives. I love when I finally get to make a connection, and they see themselves in me, because I teach at a Hispanic Serving Institution. So I feel like I'm more needed by these students than in other spaces.

Her story includes how she leans into her marginalized identities to help students through her service and leadership roles at her university. But that is variously valued by her institution.

> I think that I'm celebrated in a … I don't wanna say fake. I wanna say, **I'm celebrated in a checkbox kind of way**. You know, we have hired a person of color. We have a person of color on the committee. …. It's like a **diversity tax**. I feel that all the time. … **it's a lot**. I'm doing a lot already. Right? ….
>
> I can bring my experience, my perspective. …. I kind of bring that insight into a lot of the spaces I'm in, where I'm like, "oh, a student told me this….." …. It goes back to students celebrating me. And **I'm being kind of used**, in a way, by administration and things like that.

Here we see a typical situation where women and faculty of color shoulder extra service work in higher education, particularly those with multiple underrepresented backgrounds in STEM [45]. This work might be personally fulfilling but it can become an overload and detract from devoting time to research which is more respected and rewarded in academia.

She discussed the need for mentors, her lack of being mentored, and her personal commitment to mentoring other junior faculty.

> My journey has been difficult. It has been **lacking mentorship**, which is why I volunteer all the time to be a mentor. I was in a [DEID] program last year where I got training on how to be a strengths coach. And I started my own faculty mentoring program last year. And now I'm working on a peer mentoring program for students. These are the spaces I want to be in. These are the spaces I thrive.

> And it's also like, upon reflection, I just wish someone would have made that investment in me **so I wouldn't feel so alone**. And I also recognize that, like I said, there's something about me that keeps me on this path. I don't know what it is. It's a stubbornness. It's… I don't know. It's not pride, because I don't even tell people I'm … a professor. It's not gloating and I'm not in the news. … do I just love struggling? I don't know …

Her feelings of being alone were perhaps related to her multiple identities that are underrepresented in STEM (e.g., gender, race/ethnicity, class). Her persistence in the face of challenges could be viewed as deriving from her Funds of Knowledge. Later in her career she became part of a national community of practice that was working to support academic leadership development among underrepresented faculty in STEM.

> They created a cohort of us. …. it was a strengths-based [program]…. I was assigned as a mentor, and I met other mentors and other mentees. …. Joining these [communities of practice] really gave me a space where I feel like I could say what I wanted to say honestly, and I receive no judgment. …like if I said something to somebody else, it'd be like 'that didn't happen.' I was dismissed. **I didn't feel dismissed in any of these spaces**. I felt like people were nodding their head like, yeah, okay, I get what you're saying.

The role of being a mother also compounded her challenges as a professor in STEM. Previous research has explored parenting challenges for women in academia [46], [47]. There was a lot to juggle with adding administrative tasks on top of her already busy schedule as an academic doing research (i.e., "I have a 5 million dollar grant"), teaching (2 classes every semester), and service (i.e., "I have 5 or 6 other things that I am the chair of").

> I wake up at 4 o'clock in the morning. …. I get my daughter ready. I take her to school. I continue working until 4:30 when I pick her up. …. I just feel like I'm given little consideration for the sacrifices that I've made to do a good job and to be respected. And to be in these spaces with these other men that have this incredible luxury of a stay-at-home wife.

Maintaining a work: life balance is critically important. Culture and gender play a role in obligations outside of work. She spoke about her path to academic leadership, where she experienced hierarchical microaggression [48].

> I was very vocal about my interest in leadership. … I applied for chair … and then I was asked to step down [from the interview] because a full professor didn't like that I was competing against him. …. he didn't want to lose. And he ended up losing anyway. …. this was a very senior faculty member who just wanted chair so he could retire at a higher rate. It wasn't about change. It wasn't about engaging students. It wasn't about helping students. It was about money and significance. And those are the people we should not be encouraging to run for chair. But these are the people that, I think, are chairs all over the country.

She spoke about the need for systematic change in higher education. And this related to a variety of experiences with being marginalized which undermined her ability to lead her department.

> I think for this to change, it requires a lot of institutional change. It requires administrators that actually give a damn about us. At [DEID institution] I can say that they're trying. They're trying to make a change. But it will take, I would say, a decade for it to really be effective. Because of the faculty that are teaching today, I would say it's like 50 : 50. Like half of them are on board with EDIB [equity, diversity, inclusion, belonging]. Like they're on board with

> institutional change. They are student centered. They can adapt. …. And then the other half was like, no. …..
>
> But when it came to me when I walked into this leadership position, I just felt all of these older men… I felt tension. …. **They do not respect me, they do not see me as an equal. They do not see me as a leader**. They think I'm a child, or they think I'm inexperienced, or they think that I'm dumb, or they don't like me because of many, many factors or just one factor. …. It's because my last name is [redacted]. It's because I am a woman. These are the reasons why **they don't listen to me**.

She discussed how change was slowly happening to make things better for women and women of color in academia. This change needed support at the highest levels.

> [Here] female Deans … really have done tremendous work to change the landscape. …. before I would always get told 'we can't say yes to every person of color. We can't just interview them because they're a woman.' And I'm like, 'No, you misunderstand me. I don't say we should interview somebody because they're a person of color, or because they're women. **I'm interviewing them because they come with a different set of skills and different set of experiences that can relate to our students**.'

She points to important skills and experiences that are relevant; these might be related to a low-income upbringing rather than visible demographic characteristics (e.g., gender, race). She was hopeful that changes in academia might better support marginalized students, faculty, and staff. It is unclear with new legal rulings and pushback to DEI initiatives around the country what will happen moving forward. In this story it generally wasn't clear the extent to which being from a low-income background versus other intersectional marginalized identities (e.g., woman of color) was significant.

Extended Story 3

One individual shared a particularly compelling story where she clearly identified issues associated with socioeconomic class at multiple points. The story of her journey in STEM began as a child.

> …. I also began learning different things from my grandmother and father about science. …. As a young kid … I watched a lot of …. the science programs, even though English is not my first language. ….
>
> I went into the most poverty stricken school system in [DEID]. .... So I began, I didn't have that many opportunities. But lucky enough, there were teachers …. [who] started a science club in Junior High, and that was really rare. And I remember that they started encouraging me. I had a science class, and I really loved it. …

She tells a story of participating in a Science Fair. "My parents only have a sixth-grade education so … they never helped me on any of my schoolwork." All the kids creatively figured out how to use low-cost items in their environment [e.g. "aqua net bottle with a candle"] and "some of them were dangerous." The story of the science fair hints that because the kids couldn't rely on their parents or buying kits and expensive materials they were learning differently with lessons that perhaps helped them later (e.g., Funds of Knowledge). Picking up her narrative:

> That was my reality. I grew up in that. And those are the stories I do not hear in higher

> education, very few and far between like that. **Nobody comes from my class, and nobody has those experiences**. …. Unfortunately, because I did go to that school, I did not receive a very good science training. …. **I was born into poverty** …. It was a mishmash of all of that; good and bad education, good and bad experiences. All of that together created me.
>
> But what really pushed me was when I was in high school, and I realized that **scientists were studying us**. And basically in … my hometown … there were a lot of environmental justice activists that were coming out and shouting that we were dying. …. And then the University of [DEID] came to my high school to recruit for a study of the health impacts of these chemicals. …. But they never came back and told us what the results were at all. That fueled me.

The paragraphs above describe that she had an interest in science and passion for learning from a young age. But her school in a poor area was under resourced. Her experience with scientists who studied her community because of health concerns but didn't respect the community enough to help them sparked her passion to conduct community engaged research. Her story continues below about the challenges she had going to college.

> …when I landed in higher education at the Ivory Tower I wasn't ready…. So I had to work triple, quadruple more than a lot of my peers. …. In my undergraduate I had to have this white male that helped me a lot. Dr. [DEID] saw my talent, saw my passion, and he decided to help me as much as he can….
>
> When I went into the Ivory Tower I realized that my passion, my drive, **was not enough**. …. And I realized that it was meant to keep people like me out.
>
> And I realized that the only thing I could do… because I cannot change my skin color. I cannot change who I am, my culture. Because I'm gonna be real with you, you can't beat the [descriptor] woman out of me like that. It's really hard, you know what I mean. So I come with these certain ways of being that just the Academy like, "Eeh", you know what I mean? And that's when I started realizing that even **the women that look like me were not like me**. They went to private schools. Their parents had money. And they weren't struggling like I was. They did not have all [my challenges]. [When] I would kind of tell them some things I started realizing, oh, shoot! I shouldn't share that stuff because it's also only within my culture. And these people of color will not understand. …. I grew up with different values and different ethics than a lot of my colleagues.
>
> At first [I thought] that it was race. But especially now that I sit with a doctoral degree, and I look side to side at my other female doctoral women of color. **It's class. That's the difference**. Period.

She was fiercely proud of who she was and her multiple identities. But she realized that appearing from the outside like others (e.g., a woman of color) did not mean that others understood her or shared her upbringing. Women of color raised in privilege and money had very different experiences in higher education. She continued to elaborate on these ideas:

> If I tell you, oh, yeah, get more minority women in there. That's not solving the problem [of environmental justice and poverty]. I told you, with the other women in my doctoral [cohort], I look at them, and **I cannot relate to them**. At all. At all. I'm sorry, I cannot relate to them. I cannot relate to women that have gone to private schools. I cannot relate to women that have

> gotten a really good primary education, a really good junior high education, a really good high school education. I cannot relate. **I cannot relate to women in higher education that don't come from poverty.** Period.
>
> If I really answered you with, you know, that stereotype, what they say, "Get more women of color in there. Get more money for them. Pull more women." No. Because guess what, I've struggled and I've suffered in there. And I don't want more women of color to be put in there if they're gonna go through my journey at all. Because it tells me **that institution is not ready for us**.

She felt very different from peers that came from wealthy backgrounds and received private schooling. She worried that others like her would be abused in academia. When asked to discuss elements that were helpful in her journey in higher education, she continued her story by discussing two important people who were her mentors:

> Dr. [A]. He was a useful mentor to me. He was a compassionate mentor, and he's white. ….. **A lot of white males have helped me**. **And a lot of, unfortunately, women of color have not been that supportive of me**. …. But Dr. [A] has been the best mentor and Dr. [B] who is a woman of color. But I have to tell you why.
>
> Dr. [A], poverty. **He's from poverty**. …he ended up working through college as a construction person. And so he knew about that class side of me. He was a white male that actually worked hard, struggled, and he knew. And he not only helped me become the researcher I was… He was like, [Interviewee Name] here's all the money you want. Here's a community engagement [project]. Do whatever you want. I trust you just with your Master's degree. **He trusted me**. He trusted me that I was a good researcher.… We got [a prestigious grant]. I had a [DEID] research center. Everybody knew me at a national level at [GRANT], because I was actually one of the people that was innovating and showing all the other [DEID] programs what a community engagement course should look like. They gave me the opportunity and they treated me like a colleague and **they respected me**. Still, to this day, I go and I visit [Dr. A] and he gives me the best advice ever. Right now he's telling me to get out of the University, that I don't belong here, and that … they're not worth it....
>
> And [Dr B]. Poverty. She's from [country], came on a boat, almost died. Lived in the foster system. Crazy. She's the other one that saw me, and was like "this woman is a fighter. This woman belongs here, I don't care." And she convinced me to get my masters. … she helped me get interviews. When I was in a bad situation with my job, she made me quit. And she gave me a scholarship so I could finish my master's. Because I was working full-time while working on my masters. I did it all ….
>
> So those two mentors [were] the best. But what did we have in common? Class. …
>
> There's not people in my class in this Ivory Tower at all. Even the women that they compare me to in my department. They're not my class. I laugh. And they're women of color. I'm like {LAUGHS}, of course she made it. She went to a private school.

Her mentors shared a background of being raised in poverty. Starting from this shared background they saw her potential, recognized her assets, trusted her, respected her, and supported her success. One of those mentors was advising her to leave her current institution. As a follow-on question the interviewer prompted, "We're also trying to understand reasons that

women would leave STEM, leave higher ed, academia….” She responded:

> I guess the culture, right? **Academia has a very toxic culture**. And we all know this. We all write papers about it. …. Because ultimately, like I’m telling you, it's not meant for us. …. At first, I thought it was me. I thought … **what's wrong with me?** I'm actually perfect for academia quote unquote. I actually rose up from [my background], became a scientist, did all that, did some of the top national work for them, I'm perfect.
>
> Because the University of [XX], what it decides to do is bring in all these people of color with poverty. Bring them in. We need their money. But once you bring me, just like when I was at the U. of [XX], I'd become lost. And then there's really nobody to help me. And then I have to scramble and figure [things] out. And then I'm super stressed out. And then on top of it, I have all this stress and all this anxiety and all this other stuff, like mental stuff to deal with compared to my peers. They're prepared, you know what I mean? Their parents helped them fill out that FAFSA… their parents can give them money and stuff like that.…
>
> So I think that it's sometimes even a disservice to bring in these people when the system is gonna try to bounce them out. …. You're creating a system that's not gonna nurture these students. …. You're bringing in people, you're scaring them, and then they leave. And then they're in this bad situation in the end, because they feel like a failure that they didn't finish college, and then they don't have any of the support that they need. Because in the end the thing that the University wants is that money. …. A lot of people are upset. Their loans are to the top, which is part of the scheme that the system did is put a lot of people in debt, especially a lot of people of color without means.

In this part of the interview she talked about lacking some forms of capital that those from wealthier backgrounds bring. This was a contrast to some earlier parts of the interview that seemed to hearken to her beneficial Funds of Knowledge. Here we see hints of imposter syndrome for herself and concerns that others will also face these feelings.

> [Academia has] a hierarchy. …. And then they had all these rules. … there are these **unwritten rules**, and it's made for classes that are not in poverty….
>
> I don't know how to say it. But that's how I feel. It's like, basically, if you didn't belong to a certain class, you basically arrive and you're like in the remedial side…. You have to catch up with all this stuff. Even right now it's so frustrating for me as a young investigator. I have to figure out what this means. …. I'm from a place of poverty. I'm to the point, straight, direct. I don't play games. …. And that's a difference between their culture and my culture.

These last parts of her story evoke ideas of hidden curriculum. Overall, in the story above we learn that this woman often felt disrespected and that her background of poverty was unseen. Through her experiences she understood underserved and minoritized communities and that understanding combined with her technical expertise to make her an ideal leader for a grant-funded community engagement program. Others expected she would ‘fit in’ with other women of color, but she knew that many had been raised in privilege including high quality private schools. She noted that her best mentors had also come from poverty, while some women of color had not been good mentors. She also worried that academia was just using low income minoritized students to extract tuition dollars. Often these students were not getting the supports they needed, with negative ramifications extending beyond high levels of debt to perhaps more egregiously

taking away their self-esteem or confidence by making students “feel like a failure.”

Conclusion

This paper shared stories from the journeys in STEM fields in academia of six women of color who came from low-income, first-generation backgrounds. Additional characteristics such as being a parent or religion may be important and warrant further study. The women held a range of identities that are variously marginalized and under-represented in STEM and among academics. All had earned doctoral degrees in STEM fields and were highly successful. These women were making important contributions to society through their work which included community engaged research, service advising students from low-income, first-generation, and/or minoritized backgrounds, and/or mentoring other faculty. All six had motivations to contribute meaningfully to improving the lives of people, and particularly those from similar backgrounds. Their multiple intersectional identities as women, people of color, and coming from poverty or first-generation backgrounds imparted various funds of knowledge that were helpful on their journeys in academia and forging successful paths in non-traditional ways.

All six described challenges they had encountered and were still experiencing. Negative experiences were attributed to the behavior of individuals and structural elements in academia. Most were acutely aware of the trade-offs of meeting their personal and professional goals in academia versus other options such as working in industry, for the government, or with non-profits. Future research should explore faculty experience disaggregated by institution type (e.g., an HBCU vs. PWI), in addition to social class. Additional interviews with women of color holding doctoral degrees in STEM fields who chose non-academic careers are also planned.

It is hoped that the results can serve multiple goals. We hope that women or others who are facing challenges in academia can realize that they are not alone. Bringing unique intersectional identities into academia can be isolating, particularly characteristics that are not readily visible (such as a low-income upbringing). The stories the women shared may make you feel less alone. Perhaps people in positions of power within academia (e.g., tenured faculty) will become more open in sharing their socio-economic background and upbringing, which could contribute to greater awareness and less stigma. Further, there is a cumulative impact on minoritized women who identify as first-generation and/or come from working class backgrounds in STEM fields that must be addressed by educators, researchers, and those with institutional power.

We hope that everyone respects the funds of knowledge and other assets that first-generation scholars from low-income backgrounds bring to STEM and academia. Individuals from these working-class backgrounds are hugely underrepresented as faculty but bring uniquely important contributions. Community engaged research in partnership with underserved communities and STEM research that contributes to achieving social and environmental justice are examples of areas where a low-income background provides helpful capabilities. STEM disciplines need to respect a range of scholarly contributions, moving beyond valuing only traditional lab-based research on fundamental topics to embrace research using different methods that yield more immediate real-world benefits.

Women of color from low-income backgrounds need to be on the alert for being over-assigned to service tasks. The “diversity tax” and service overload for faculty from marginalized groups is widely documented. The motivation to help others, particularly students from similar marginalized backgrounds, should not be exploited. If these women are taking on those service

roles they need to be relieved of other service assignments.

There are also important challenges and obstacles that face women who are the first in their families to graduate from college and/or earn graduate degrees. Academia is steeped in hidden curriculum, so individuals need support to reveal these unwritten rules and navigate them successfully. Any faculty can step up to share information, serve as a mentor, or offer support. Mentors should not be assigned or assumed based on visible demographics (e.g., gender, race). There were stories of white males who were important positive mentors for these women, as well as women, minorities, or people of color who had not been supportive. Women of color from low-income backgrounds may need to be proactive in seeking out multiple mentors able to provide guidance in different ways.

We caution everyone to avoid stereotyping their colleagues. Each person has a unique combination of assets and challenges. Women of color may come from affluent backgrounds. White men may have come from poverty. Important attributes may not be visible – religious beliefs, being a parent, chronic health issues. Everyone deserves to be treated with respect and empathy, given equitable opportunities to succeed, and supported. The competitive and impersonal nature of STEM in academia can be isolating; we can all reach out to help others feel included and foster a sense of belonging.

More broadly, people need to band together in solidarity to make changes in the structure and culture in STEM fields in academia. Current practices may place unnecessary obstacles in the paths of low-income women of color. One recommendation is to ensure that practices are written down as policies that can be transparently shared with everyone. These policies are needed within each individual department, aligned with the strategic goals at the highest levels of the university. Unfortunately, stereotypes and biases mean that even good policies are not fairly applied to everyone. Each person bears responsibility for their individual actions that contribute to building equitable environments that support the thriving and success of individuals from a diversity of intersectional identities.

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