Lived experiences of black women pursuing STEM in UK higher education

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Black students and researchers in higher education (HE) face scarcity of relatable role models in STEM subjects. Black women are under-represented in STEM and their outlook is under-researched. We undertook this project to understand the perspectives and challenges of black women in STEM HE. This qualitative research identified themes from semi-structured interviews of self-identified black female students and academics in UK HE. Black women face challenges due to both sexism and racism in academia, and under-representation in STEM subjects leads to isolation. Role models, mentors and academic support networks can be a source of inspiration and facilitate career progression.

STEM encompasses academic disciplines relating to 'science, technology, engineering and mathematics'. According to a report by the Royal Society, the proportion of black students entering undergraduate (UG) and postgraduate (PG) education has increased over the past decade, but they are leaving STEM in greater numbers at all stages of the career pipeline.

One issue facing black students and researchers in higher education (HE) is the scarcity of relatable role models within HE leadership. Previous studies show positive and relatable role models can impact the decision to apply for university and can influence their degree choices. While black role models are present, low visibility makes them inaccessible. According to Higher Education Statistics Agency 2020/2021, there were about 18,710 white professors compared to 160 black professors in UK HE; 6.06% of UK-domiciled students and 2.3% of academics were black. Increased workforce diversity in UK HE could boost black academic representation and increase student accessibility to positive and relatable role models.

Black women are under-represented in STEM and their perspective is under-researched. Lived experience research illuminates personal stories, enhancing research quality and overall cultural relevance. We undertook this project to understand the perspectives and challenges of black women in STEM HE, focusing on the importance of diversity, representation, and role models.

Ten black female UG/PG students, and academics in UK STEM HE were recruited through KCL research volunteer newsletter and African Caribbean Medical Society newsletters (Table 1).

The participants were briefed of the project aims and written consent was obtained. The participants were asked a set of open-ended questions and followed up with probe questions to further their response. The interview was transcribed, and themes were identified, which are further discussed here.

Challenges in STEM

Like others, black women have varied motivations for pursuing a career in STEM: intellectual curiosity, good job prospects, pursuing a childhood dream:

"When I was a kid, I used to say 'science is like magic' and I still think that."

However, black women encounter an additional complex overlap of challenges related to gender and race in STEM. Most participants agreed they faced challenges specific to being a black woman (Figure 1).

Black women feel ignored and alienated in STEM spaces, where they also confront negative stereotypes and unfair expectations.

"Sometimes, I feel like you must be a certain type of black women to get far in STEM... the way you speak, the way you present yourself, your demeanour... If this is not seen as acceptable… you won't get the help you need. You will not get put in certain positions. There are some moments where you feel like you cannot be yourself to get up, and it's not easy to do that all the time."

Table 1. Summary of academic disciplines sampled and their respective universities

Undergraduate	**Third year medical student – Norwich Medical School**
	Third year biomedical sciences student – King's College London
Postgraduate	Second year sport and exercise science doctorate student – University of Kent
	Second year biotechnology doctorate student with joint industry employment – King's College London
	First year neurochemistry doctorate student – University of Cambridge
	PGCert trainee child well-being practitioner – King's College London
	Postdoctorate researcher in immunology – University of Dundee
	MSc Software Engineering (project manager in IT infrastructure) – Heriot Watt University
Staff	Senior tutor in Clinical Communication and Human Values; Liaison and Support Lead – King's College London
	Lecturer – King's College London

Figure 1. Participants' answer: 'Do you feel you have faced any challenges that are specific to being a black woman?'

Feeling ignored by institutions/supervisors can contribute to attainment disparity across ethnic groups. In 2018/2019, white students were twice as likely as black students to graduate with first class honours (35.7% vs 17.9%). Black students were three times more likely than white students to leave their first degree with a third (9.5% vs 3.2%).

Few felt comfortable reaching out to their institutions/supervisors. Reasons included feeling like the topic was taboo, not wanting to be a burden, loss of faith in institutional reporting systems or fearing repercussions from institutions/supervisors who contributed to the problem.

"…I feel like I must work 10 times harder to prove that I can use [this opportunity] and do something... We can't be vulnerable or express discomfort, even though we should be able to have these conversations to make work and education better."

Many black women cannot discuss these issues freely with colleagues either, causing isolation:

"You can't talk to everybody about it because they don't understand or they don't get it, or they don't want to get it, or they're quite fearful of the topic. As soon as you start to talk about colour or race… people get a little bit uncomfortable"

Most women had considered leaving STEM and/or academia – many due to specific challenges mentioned above:

"If it's a personal thing, I can conquer this, I can come in the next day and be different… but when you realize its affecting people like you, then you realize it's not gonna stop there, that can always negatively affect your whole view of that opportunity, career, degree because you think, how can you move forward?"

Despite this, all participants continued their STEM journey, motivated by their achievements, family support, and sheer tenacity:

"I worked a lot to get to where I am today. I will have that PhD because I decided I will. Then I can see how proud my family is when they speak about me, and what I've achieved so far…"

However, this sample is biased – not all black women in STEM can find reason to stay considering those challenges. How can the STEM community better support those who stay, and future aspirants? Possible solutions include fostering a sense of belonging and increasing representation of black women in STEM, to increase access to relatable role models.

Belonging in STEM

Belonging refers to feeling included and validated as a person in a group. Belonging improves mental well-being, academic performance and student retention. In literature, women and students of colour consistently report less belonging than men and white students, attributed to feelings of alienation and lack of support. Interviewees had mixed perceptions on what determines a sense of belonging: internal factors (adapting to one's environment) or external factors (creating an inclusive environment) (Figure 2).

Most women felt they belonged, often due to diverse representation and supportive supervisors. Many felt more comfortable speaking about race-/gender-related challenges in diverse environments, and with supervisors/colleagues who shared a similar background:

"...I do feel more welcome in academia than I feel in industry. My supervisor is a woman of colour. I think that has impacted the way I have viewed myself… she understands the differences in being a woman of colour in higher education systems and in industry. So, I do feel like I'm able to be more open with that side of the team, because her entire team has a similar mindset."

Therefore, diverse environments and supportive seniors contribute to a sense of belonging for black women in STEM, improving retention and career satisfaction.

Representation and role models

A role model is someone whose behaviour in a particular role is imitated by others; they are important for an individual's development and sense of belonging. Parents can act as a first role model. Research shows having a parent who already works in a STEM career positively influences children's aspirations towards STEM. One woman had both parents involved in engineering, citing them as her reason for joining STEM.

Students with race- and gender-matched role models are shown to have higher academic achievement than students with no role models or unmatched ones [9]. However, visible representations of black women in STEM in UK HE institutions are rare, making role models harder to find (Figure 3).

If undergraduate students do not see themselves in their teachers, they can feel alienated from these disciplines, contributing to the cycle of under-representation in senior academic positions. Therefore,

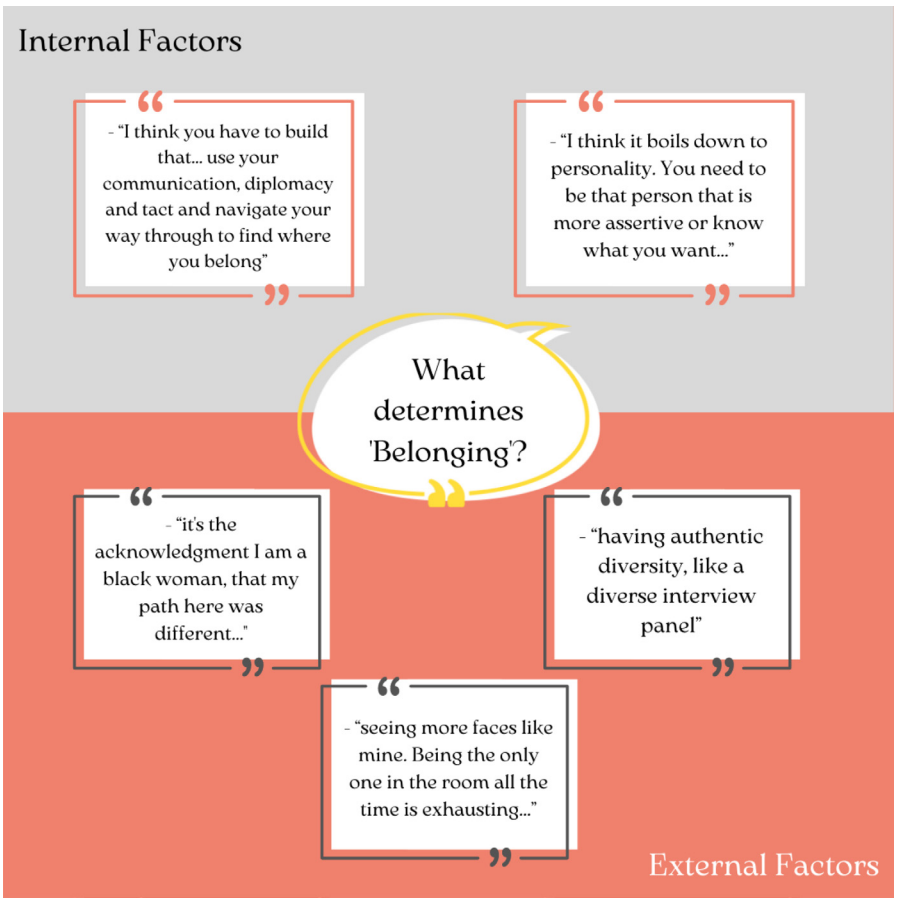

Figure 2. Participants' answer: 'In an ideal setting, what contributes to a sense of belonging in STEM?' Responses are split based on opinions relating to internal and external factors.

increased representation of black women in STEM can increase accessibility to relatable role models. However, relatability is not simply about sharing a similar ethnic background but sharing a similar journey. If a black female senior academic has a relatable academic journey, it makes their path to success feasible for other black women, inspiring more to pursue senior roles: "ultimately it's less about the number of black women at the top, but really how they got there."

To deal with under-representation, black women in STEM are attempting to bridge the gap. One woman started the Black Women in Science Network, creating a community to empower black women in science through events and mentorship. Other women are involved in Equality, Diversity and Inclusion (EDI) work:

"I've put myself out there on EDI panels... because of that, it's making me feel like, yeah, I do kind of have a place here."

However, black women often also take on the role of part-time student/researcher, part-time activist: campaigning for EDI in their institutions, alongside their studies. Though an important task, few understand the associated mental and physical toll. Some black women feel they are not able to freely enjoy their course/career without considering the political/social implications of their minority status in STEM. Addressing under-representation is a collective responsibility, which should not be solely shouldered by black women:

"it's not just my role to get involved [with EDI]. It's for all the people as well, and I shouldn't feel like I have to be a vehicle for change because it's on others as well."

Mentors

Mentoring can help under-represented groups navigate a STEM career and gain access to new academic networks. All women agreed that mentors are important for career progression, though its effectiveness relies on good working relationships. Many women had access to a mentor:

Figure 3. Participants' answer: 'How often do you see people who look like you in your degree/workplace?'

"My current supervisor has always been a mentor of mine… she has really been a big supporter, and she's one of these people that actively encourages me to do things."

Some women had mentors who were also black or women, allowing them to seek advice on navigating a STEM career while being a minority. Therefore, mentors can also act as role models where they share gender/ethnicity:

"he's from the same minority background, so seeing that he's able to get those opportunities is something that I look up to, he's at a high level in his academic career that I also aspire to be at"

However, fruitful experiences were not limited to mentor demographics – being supportive and an advocate in a professional setting is highly valuable:

"Having those connections, having that network through a mentor definitely helped to give me a bit of an advantage and I feel like it's one of the most important things as a minority to have."

Future aspirations

Despite challenges, black women are still ambitious, aspiring to reach heights in STEM academia:

"I'd actually love one day to be a lecturer…"

"My end goal is to finish [my PhD] with good mental health… also having gained some other skills as well in business and coding, not just with a doctor in front of my name."

Some also plan to use their experiences to mentor future black women in STEM:

"As a black woman, what keeps me going is the fact that I could be a role model for someone... I can inspire the next generation of black women in STEM because I will achieve that position, I'll achieve that career."

Though the journey is tough, we as black women should also remember to celebrate our achievements along the

Figure 4. Participants' answer: 'In your STEM career, what are you most proud of so far?'

way, especially in a system that is not often built for our academic success (Figure 4).

Conclusion

Through this project, we gain a glimpse into the lived experience of black women in STEM. Black women are ambitious and driven, much like everyone else. While we all experience challenges in our career, black women face additional challenges of feeling ignored and alienated through combined issues of racism and sexism in academia. Alongside under-representation in STEM, navigating an academic career in these disciplines can be isolating and unfulfilling. Role models and mentoring provide an invaluable source of inspiration, facilitate career progression and give black women supportive networks they might not have had otherwise. Our interviewees have showed us diverse, inclusive and supportive environments are key to black women feeling welcome and, ultimately, thriving in STEM. As part of the dissemination process, the lead author has submitted an abstract to a national education conference. The research findings will also be shared with King's College London Widening Participation, Student Success and Student Union. We would like to highlight www.stemwomen.com, a website dedicated to women in STEM subjects whose aim is to create an inclusive and diverse STEM workforce.

Even though you as a reader may not be a black woman, consider the diversity, inclusivity and support your teams offer to minority groups. Consider how your institution can be part of the solution. As one interviewee summarizes: "it is not just about having a black woman in a position of power, but her journey." ■

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