

# **An Exploratory Literature Review of Learning Experiences of Black Women in Engineering**

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# **An Exploratory Literature Review of Learning Experiences of Undergraduate Black Women in Engineering**

The discipline of engineering has historically alienated ontologies and epistemologies from socially marginalized groups to maintain settler coloniality within the field [1],[2]. In engineering, epistemologies from racially marginalized groups are presented as alternative and illegitimate compared to “conventional” Western ways of knowing [2],[3]. The centering of Whiteness is evident in higher education, specifically engineering, as the insertion and designation of theories created by White male engineers as “objective” and “rational” [3]. This centering of Whiteness justifies the educational disparities present in other racial communities concerning academic achievement and success [4]. In conjunction with the centering of Whiteness in engineering, a lack of intersectional analysis hinders the accurate understanding of the issues engineering students face. In engineering education, research on students of color lacks the inclusion of gender as a factor for varied experiences within race and ethnicity [5]. In these articles, the prevalent and pervasive nature of sexism within engineering departments is understated, if not missed entirely. Therefore, such research presents racialized narratives that obscure the barriers and hindrances caused by sexism. Similarly, research on women lacks the inclusion of race as a factor within systematic sexism analysis [5], which obscures hindrances caused by a racialized society.

For Black women, racialized and gendered narratives work together to render their nuanced experiences invisible within academia and society. In engineering education, the negative experiences of Black women in the classroom are routinely documented [6]. These experiences in the classroom are attributed to their home culture (i.e., how their academic preparation is supported at home), previous high school preparation, and lack of support [6]. Despite existing research on Black women, there is a gap in literature concerning Black women and their perspectives on their visibility in the engineering classroom. Visibility in the classroom is about being seen in the curriculum, physically in the space, and in conversations about engineering. The lack of visibility for Black women’s narratives has profound effects for Black women in the field of engineering. Invisibility in the classroom allows for them to be marginalized further. Therefore, the purpose of this literature review is to understand the intersectional experiences of Black women in engineering education.

When reviewing the literature on Black women in engineering, it is also important to use Black-centered theories to understand the interactions of Black women as assets-based pedagogies are not typically used to center the experiences of Black women in higher education [7]. Black Feminist Thought (BFT) is a critical social theory that allows for Black women to be seen in various formats [8]. Specifically, BFT looks at Black women in connection to the intersections of race, gender, and class. Leveraged in engineering, BFT acts as a lens to view Black women’s perspectives within and outside the classroom. One of the core themes of BFT is self-definition. Self-definition is linked to the voice for Black women, as well as various definitions of the word strength inside of the engineering space. Black women’s voice is novel to the field of engineering as most of the studies about them decenter their voice but amplify their

obstacles. Therefore, to focus on an asset-based understanding of Black women's experiences, the research question guiding this literature review is, how has Black Feminist Thought been used to understand the experiences of undergraduate Black women in engineering?

## **Methods**

We chose to utilize a scoping literature review approach to understand the experiences of Black women in engineering. Scoping literature reviews are useful in understanding the main concepts of a research area and highlighting knowledge gaps [9].

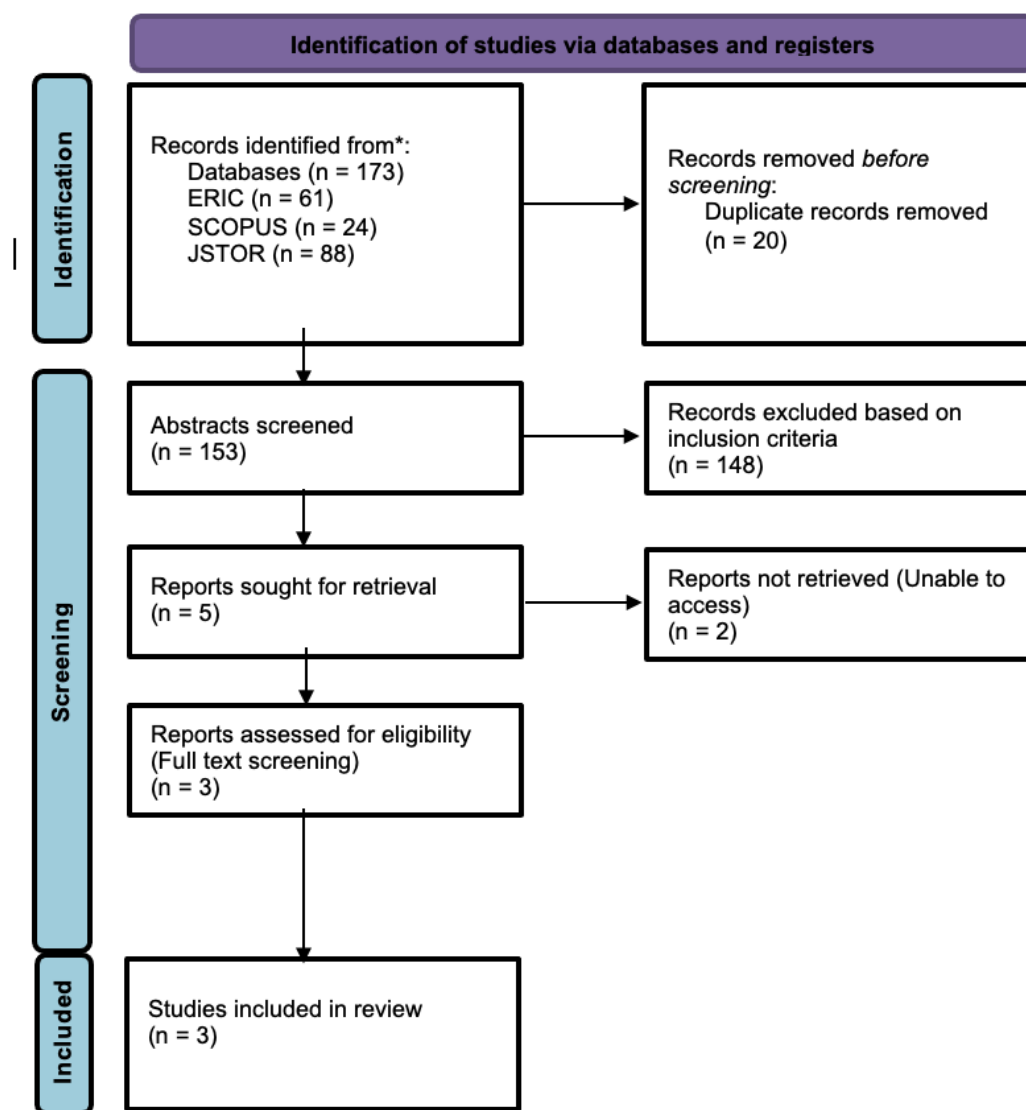
We first consulted with a librarian to aid in conducting the literature review. The librarian helped with creating search terms and aided in our understanding of how to scan the preliminary results from the search results. We used SCOPUS, ERIC, and JStor to locate articles for our literature search as these databases cover a broad range of sources pertaining to engineering education. We used the following search terms to address the Black feminism aspect of the research question: "Black feminism in engineering education", "Black feminist", "Black feminism", "womanism", "African American feminist thought", and "critical race feminism". In conjunction with those search terms, we used the following to address the engineering education aspect of the research question: "engineering", "pedagogy", "curriculum", "classes", "teaching", "identity", "culture", "belonging", "education", and "academia". Boolean operators like AND and OR were used to separate the terms within the search engine. We ran these searches in November of 2025 and our search strategy resulted in a total of 173 articles for initial screening. Out of the 173 articles, three of them fit our inclusion criteria which is further detailed below. An overview of the literature selection process is included in Figure 1.

To select articles for our review, we first screened the abstracts to see if the article was appropriate for our research question. Inclusion criteria mainly included studies focused on undergraduate Black women in engineering. We also primarily focused on Black Feminist Thought being used as a theoretical/conceptual framework to understand the experiences of Black women and excluded articles without this explicit theoretical/conceptual foundation because Black Feminist Thought leverages theory to understand the intersectional experiences of Black women within their educational context.

We also specified that articles were empirical and about the experiences of students in the United States of America. We excluded articles about Black men and Black students in a general sense. We then screened the search results to focus on undergraduates and excluded research on graduate students and industry engineers. A full list of the inclusion and exclusion criteria can be found in Table 1. Once the abstracts were screened, we then moved to reading the full articles and highlighting the important findings. We took notes on the main points of the readings and compared them to find the similarities and differences between the articles.

**Table 1.** Inclusion and exclusion criteria guiding the scoping literature review.

| Inclusion Criteria                                                                                                                                                                                                                               | Exclusion Criteria                                                                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Undergraduate Black Women in Engineering</li> <li>Empirical articles</li> <li>Used Black Feminist Thought as a Theoretical/Conceptual Framework</li> <li>Based in the United States of America</li> </ul> | <ul style="list-style-type: none"> <li>Graduate Students, Black men or Black students in general</li> <li>Industry engineers</li> <li>Non-empirical studies</li> </ul> |



**Figure 1.** An overview of the literature search and screening process

## Findings and Discussion

### *How has Black feminism been used to understand the learning experiences of Black women in engineering?*

The literature search resulted in three articles that fit the inclusion criteria [6], [10],[11]. All of the articles used Black Feminist Thought as their main framework to analyze the experiences of undergraduate Black women in engineering. Gibson and Espino [10] used BFT as a theoretical framework to center the experiences of Black women in engineering and detail how Black women understand their womanhood inside of the engineering space. Morton [11] used BFT as a conceptual framework to describe the experiences of Black women in engineering, specifically the challenges that Black women encounter in the classroom. Lastly, Stitt and Happel-Parkins [6] used BFT as a theoretical framework to understand the experiences in the engineering classroom concerning racism and sexism for Black women. There were other studies that mentioned Black women in engineering but did not use BFT within their conceptual, methodological, or theoretical frameworks. These studies were excluded because they lacked the centering of Black women's lived experiences in engineering, which is the focus of this scoping literature review.

Each of the three articles included in the review described the experiences of Black women in the engineering discipline. In the Gibson and Espino piece [10] the main themes were: naming stereotypes about Black women engineering students, "outsider within" status as an engineer, accepting identities, redefining Black womanhood, and role modeling. Morton's article [11] about critical race counterstories discussed the postsecondary education experiences of Black women in STEM and presented two main themes: challenges Black women encounter in STEM and strategies to remain encouraged while in STEM. This article is different from most in that they used composite counterstories to detail the experiences of Black women in STEM. Like the other pieces, Stitt and Happel-Parkins [6] discussed the postsecondary experiences of Black women in engineering. The two main themes in this article were: "challenging stereotypes" and "persisting for future generations" [6].

While the above articles described various challenges faced by Black women in engineering, by leveraging BFT, the articles also highlighted the assets that Black women in engineering possess. Challenges included being overlooked for their work and having to prove their academic intelligence. For example, both the Stitt and Happel-Perkins' [6] piece and the Gibson and Espino' [10] piece highlighted the element of agency for Black women. Specifically, Stitt and Happel-Perkins [6] described how Black women challenged the negative stereotypes they encountered by enacting their agency through their demeanor and actions. The authors provided examples such as how one of the participants reminded herself not to get angry and become a stereotype when a professor made a racially insensitive comment/joke. In this example, the participant exercised her agency by maintaining a cool demeanor to combat the negative stereotype. Similarly, in the Gibson and Espino piece [10], one of the participants managed the negative stereotypes about being an angry Black woman by being cautious of how she represented herself within the classroom. Gibson and Espino [10] also talked about how

Black women enacted agency by creating spaces for Black women to express themselves. Specifically, the Black women participants in their study sought out extracurricular clubs to serve as spaces “to explore Black identity” [10]. These clubs mainly served as safe spaces for Black women to discuss issues within their life. Despite exercising their agency, the authors also mentioned that some Black women participants felt as though the extracurricular clubs weren’t fit to address the “double minority” experienced by Black women.

Aside from agency, a common asset that Black women in engineering demonstrated was persisting despite the adversities they faced. In the Gibson and Espino piece [10], Black women perceived themselves as strong students capable of achieving success in engineering. Specifically, Black women in the Gibson and Espino [10] study discussed how they perceive themselves as “strong, hardworking and team players” [10]. However, despite perceiving themselves as great team players, Black women participants were regularly disregarded in their group work and expressed feeling like they weren’t being heard or contributing to the group projects they were assigned to. Similarly, in the Morton [11] piece, Black women discussed strategies used to deal with challenges they faced in STEM in order to remain in the engineering discipline. Examples of these strategies included a participant discussing an idea to start a mentorship program centered around early STEM exposure and participants describing being a part of a support program for underrepresented members of marginalized communities in STEM. As Black women contend with microaggressions, sister circles or support programs are helpful for success in the oppressive engineering environment. In the Stitt and Happel-Perkins [6] piece, Black women described challenging stereotypes as means of persisting in the engineering discipline. Specifically, all of the participants in the Stitt and Happel-Perkins [6] study expressed the idea of persisting for future generations despite the challenges they faced. One of the participants also described meeting a Black woman professor that ultimately told her to change her major which was disheartening and frustrating for the participant. However, the participant understood that persisting for future generations had lasting implications and chose to continue her engineering journey, highlighting the resilience of these participants.

Finally, in addition to highlighting the assets of Black women, the Black women participants in Gibson and Espino [10] had varying degrees of definitions of strength. This difference in definitions reflects the Black Feminist Thought tenet of self-definition. Some participants viewed strength both positively and negatively. In the instance of positivity, strength was considered a good trait to have because it helped the Black women engineering students persevere. On the other hand, some participants felt that the trait of strength was often seen as pushy or stubborn. The difference between participants' definitions illuminates that Black women are not a monolith. Aside from similarities, the articles could have also discussed more on how Black women exercise their agency inside of the classroom. There is potential for the articles to delve deeper into the racism and sexism faced by Black women and consequently how they shape the way Black women create space for themselves in engineering. Additionally, the articles could have addressed perceived visibility for Black women in engineering. Overall, the articles included in the review leveraged BFT to understand the experiences of Black women in

engineering and provide evidence that Black women can be studied beyond a deficit narrative to understand their intersectional experiences. Future research should examine Black women's experiences through a Black feminist lens to understand their intersectional experiences within engineering.

### **Conclusion**

Oftentimes, research on Black women engineering undergraduate students centers on a deficit framing of their experiences. These kinds of studies unjustly place the negative experiences of Black women on their home culture and preparation. This review challenges the prevailing deficit narratives and highlights how Black women's voices can be centered and better understood in engineering spaces by utilizing BFT as a theoretical lens to analyze their experiences. Specifically, by using BFT, the experiences of Black women can be shifted from deficit based to asset-based findings. From the articles included in the scoping review, we found that persistence, agency, and stereotype management are some of the assets possessed by Black women in engineering. Black Feminist Thought provided a lens into analyzing the intersectional experiences of Black women in engineering and also highlighted the nuances in how Black women defined strength. Findings suggest that future research should focus on Black women's experiences with the lens of BFT in engineering and address their perceived visibility within the classroom. This research would provide insight on the mechanisms Black women use to remain in engineering. Centering BFT in such research would provide deeper insight into the experiences of Black women in engineering from an asset-based perspective.

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