

But Does It Pass the Bechdel Test? A Scoping Literature Review of the Journal of Engineering Education’s Publications Over the Past 25 Years

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Abstract

Women's experiences in engineering education have been examined for more than two decades, yet the ways these experiences are represented within the literature remain unevenly understood. To complement existing analyses of topical and methodological trends with an explicit equity lens, this study applies an adapted Bechdel-inspired framework to examine whether and how *Journal of Engineering Education* (JEE) articles center women's experiences in relation to one another and to engineering contexts.

We conducted a scoping literature review of JEE articles published between 2000 and 2025. From an initial pool of 1,103 publications, 102 articles met the inclusion criteria of focusing on women's experiences in engineering education or the engineering workforce. Applying the adapted Bechdel test revealed that 31 articles centered women's experiences without relying on comparative framing. Most of these studies included participants of multiple genders but positioned women's experiences as analytically independent rather than relative to men. These findings highlight how representational and analytic choices shape whose experiences are foregrounded in engineering education research and point to opportunities for more intentional centering of women's voices in future scholarship.

Keywords: *women, scoping literature review, educational experiences*

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Introduction

Over the past 25 years, scholarship on gender in engineering has generated substantial insight into women's participation, experiences, and outcomes (e.g., [1–7]). However, the breadth, emphases, and representational patterns of this body of work have not been systematically mapped. Developing a more comprehensive understanding of women's experiences in engineering is critical for addressing the persistent gender gap in the field and the structural biases that continue to shape participation and advancement [8–10]. While prior work has documented disparities in representation and outcomes, less attention has been paid to how women's experiences are framed, centered, and relationally positioned within engineering education research itself [11].

The Bechdel test, originally developed as a simple way to assess women's representation in fictional media [12], provides a useful heuristic for examining whose voices are present and how they are represented within a body of work. When adapted for scholarly contexts, Bechdel-inspired frameworks can be used to assess whether women are positioned as central subjects of inquiry, whether their experiences are analyzed in relation to one another, and whether analyses move beyond treating men as the implicit point of comparison. Applying an adapted Bechdel test to scholarship published in the *Journal of Engineering Education (JEE)* allows for a systematic examination of representational patterns within a flagship journal in our field and offers insight into how gendered experiences in engineering are documented and valued in research. Examining these patterns is an important step toward informing a more inclusive and equitable engineering education research agenda.

This paper presents the results from a scoping literature review (ScLR) conducted to map the landscape of research on women's experiences published in *JEE* since 2000. Using an adapted Bechdel-inspired analytic framework, we analyze how women's experiences are represented across this body of literature. Specifically, this study addresses the following research questions (RQs):

RQ 1. *What is the current landscape of literature published in JEE around women's experiences in engineering?*

RQ 2. *To what extent do articles "pass" an adapted Bechdel test?*

RQ 2a. *How does Bechdel test passage vary across study characteristics?*

Background

Experiences of Women in the Engineering Ecosystem

Women's experiences in engineering are shaped by longstanding structural, cultural, and epistemic norms that influence who is recognized, supported, and retained in the field [13]. Research in engineering education has documented that gender-focused scholarship has, at times, been fragmented or under-theorized, which can limit the field's ability to fully examine how

institutional values, practices, and hegemonic definitions of engineering competence privilege masculinity [14], [15]. For example, Pawley et al. [14] argue that much of the gender-focused scholarship in the *Journal of Engineering Education* have historically lacked sustained theoretical engagement, constraining analyses of how power and knowledge production contribute to the marginalization of women.

More recent studies highlight how women continue to encounter subtle yet consequential forms of marginalization, including disproportionate expectations for emotional labor, exclusion from technical decision-making, and biases in evaluations that shape academic and professional trajectories [16]. These dynamics can influence women's identity development and sense of belonging in the field [13], [17], [18]. They also create conditions that have continued to lead some women to leave engineering, even as diversity-focused interventions have expanded [19], [20].

Research on intersectionality in engineering further illustrates how inequities are intensified through intersecting systems of racism, sexism, heteronormativity, ableism, and power (e.g., [5], [21–24]). Ong et al. [2], for instance, describe how Women of Color navigate compounding barriers such as racialized gender stereotypes, isolation within engineering environments, and limited access to mentoring and sponsorship. Additional studies suggest that norms emphasizing objectivity and neutrality within engineering can obscure structural inequities, making them more difficult to recognize and address [25], [26]. Collectively, this recent scholarship underscores a growing consensus that advancing equity in engineering requires institutional transformation (i.e., redefining norms, reward structures, and knowledge practices) rather than continued reliance on individual resilience within inequitable systems.

The Bechdel Test

The Bechdel test was originally introduced as a baseline heuristic for assessing women's representation in fictional media [12] and has since been taken up in scholarly work to interrogate visibility, relationality, and the social positioning of women across a range of mediums (e.g., film, social media, cultural texts) [27–30]. Adaptations of this approach have also been applied in nonfiction and professional contexts. For example, the Finkbeiner test provides guidelines for avoiding gendered framing in journalism about women scientists [31] and the “Matilda effect” highlights patterns of gender bias in recognition and attribution within academic citational practices [32], [33]. These adaptations illustrate its usefulness as a flexible tool for examining whose voices are centered and how they are represented. Building on this broader tradition of Bechdel-inspired frameworks, we adapt the logic of the test to evaluate the representation of women's experiences within articles published in the *Journal of Engineering Education*.

Methods

Methodological Overview

This paper employs a Scoping Literature Review (ScLR) to explore research published in *JEE* related to women's experiences in engineering education. The goals of this study are to characterize topical and methodological patterns, assess how women's voices are represented using an equity-oriented lens informed by an adapted Bechdel test, and identify areas for subsequent investigation.

ScLR Protocol

Scoping literature reviews are designed to map the landscape of scholarship within a defined area, providing an overview of existing work and highlighting gaps for future research. In contrast to systematic reviews, ScLRs adopt a broader and more flexible approach, focusing on the identification and synthesis of relevant literature rather than adhering to highly prescribed procedural protocols [34], [35]. The ScLR approach is particularly well-suited for identifying key concepts, bodies of evidence, and emerging trends related to a focused research area [34], [36].

Guided by the ScLR framework outlined by Arksey and O'Malley's [34], our ScLR proceeds through five stages: (1) identifying the research questions, (2) identifying the relevant studies, (3) study selection, (4) charting the data, and (5) collating, summarizing, and reporting the results. We moved iteratively among these phases to allow us to refine decisions and criteria as our understanding developed across stages.

Stage 1: Identify Research Questions

The purpose of this study was to comprehensively map and examine how women's experiences in engineering are represented within *JEE* publications. We used the following research questions to guide the study:

RQ 1: *What is the current landscape of literature published in JEE around women's experiences in engineering?*

RQ 2: *To what extent do articles "pass" an adapted Bechdel test?*

RQ 2a. *How does Bechdel test passage vary across study characteristics?*

Operationally Defining the "Bechdel Test"

To examine the extent to which *JEE* scholarship centers women's voices, we applied an adaptation of the Bechdel test for academic literature. For the purposes of this study, an article "passes" the adapted Bechdel test if it meets *all three* of the following criteria:

1. Women as focal points or primary sources: The article includes women as the (or one of the) primary participants, data sources, or central subjects to the analysis.

2. Women in relation to one another: The article analyzes or meaningfully engages women's experiences *in relation to other women*, rather than only comparing women to men or aggregating women into a single category.
3. Connection to engineering: Women's experiences are explicitly situated within engineering education contexts, such as disciplinary culture, learning environments, educational pathways, or professional formation.

This operationalization enabled us to gauge women's representation within *JEE* scholarship and assess the depth to which their experiences are positioned as central to understanding engineering education contexts.

Stage 2: Identify Relevant Studies

We used the study's research questions and goals to outline two main inclusion criteria for finding relevant studies:

1. Population focus: Women or girls are an explicit, primary focus (including intersectional groups such as women of color, Black women, Latina/e/x women, Indigenous women, etc.).
2. Context: Engineering education or workforce (K-12 outreach/pre-college, undergraduate, graduate, co-/extra-curricular, teacher/faculty development for women/girls in engineering, internships/co-ops, workplace).

Studies were required to explicitly center women or girls as a primary population of interest. Eligible contexts included engineering education and the engineering workforce across the educational and professional pipeline, including K-12 outreach and pre-college programs, undergraduate and graduate education, co- and extra-curricular activities, teacher and faculty development, internships and co-ops, and workplace settings. These dimensions were operationalized through four central inclusion criteria: (1) women or girls as a focal population, (2) engineering as the disciplinary context, (3) a clearly identifiable stage along the education-workforce continuum, and (4) attention to experiences. Additional inclusion and exclusion criteria related to publication characteristics (e.g., publication type and date) are detailed in **Tables 1 and 2**.

To identify relevant publications, we searched the Wiley Online Library database in September 2025 to retrieve all articles published in the *Journal of Engineering Education*. The search yielded 1,103 unique publications after duplicate records were removed. The publications were then analyzed in three screening cycles (title, abstract, full-text) using the established inclusion criteria.

Table 1*Central Inclusion Criteria*

Central Inclusion Criteria	Working Definition
Women/girls	A woman-identifying person.
Engineering	The focus is on the environment within engineering disciplines, academic programs, the workplace (i.e., jobs, internships, or co-ops), or out-of-class engineering involvement (e.g., engineering clubs and organizations).
Stage	The paper may focus on educational or post-educational (e.g., in the workforce) contexts. It does not need to come from a student experience perspective (i.e., it could still be included if it is in an engineering workplace setting and focuses on women faculty, staff, teachers, engineers, etc.). This may include pre-college (K-12), undergrad, graduate school, or post-grad (i.e., in the workforce).
Experience	A focus on the study population(s)' experiences, accounts, perspectives, or outcomes in navigating engineering.

Table 2*Additional Inclusion Criteria*

Additional Criteria	Working Definition	Implementation
Publication venue	<i>Journal of Engineering Education (JEE)</i>	Database search restriction
Publication type	Journal article	Database search restriction
Publication year	Dates ranging from January 1, 2000 to October 1, 2025	Database search restriction
Methodology	Qualitative, quantitative, or mixed methods approaches. Literature reviews, meta analyses, guest editorials, and editorials were not included.	Methodology was determined by authors during screening.

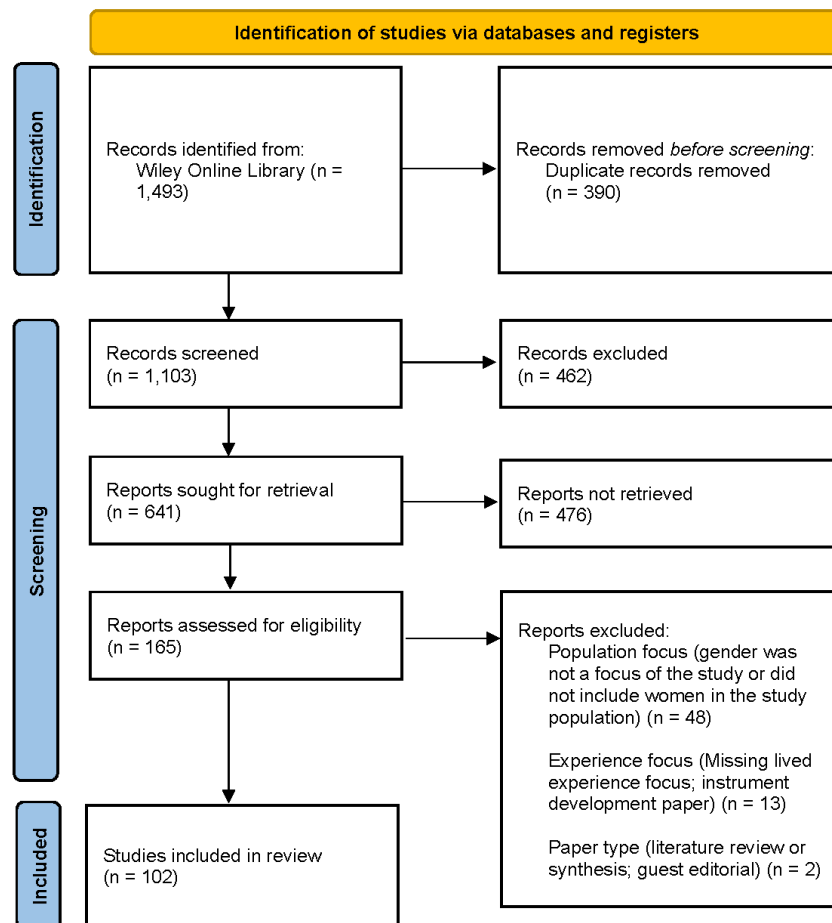
Stage 3: Study Selection

Our study selection process unfolded across three sequential screening stages: (1) titles, (2) abstracts, and (3) full manuscripts. Prior to each stage, the research team collaboratively refined and confirmed the inclusion and exclusion criteria to ensure shared understanding. Review decisions at every step were informed by ongoing, reflective discussion among team members. To support consistency in judgment, we developed a screening instrument that operationalized the criteria and provided a common structure for evaluation. Publications were then reviewed independently by two reviewers. For each assigned item, reviewers documented whether it should advance to the subsequent stage and, when excluded, recorded the specific

criterion or criteria that it failed to meet. At the full-text screening stage, the majority of excluded studies were removed because gender functioned primarily as a demographic characteristic within broader analyses rather than as a central analytic focus on women's experiences. 102 publications remained after completing the three screening cycles. **Figure 1** further details the identification process for studies.

Figure 1

PRISMA Flow Diagram for Reporting Scoping Reviews [37]



Stage 4: Charting the Data

Following the screening, we descriptively and analytically synthesized the remaining articles to identify trends over time in research topics, methodological approaches, and theoretical framing. We applied an adapted Bechdel-inspired analytic framework (detailed in *Stage 1*) to assess the extent to which articles centered women's experiences and calculated the proportion of studies that met this criterion. Importantly, Bechdel test "passage" was not limited to studies only including women. Several "passing" articles included participants of multiple

genders while positioning women's experiences as analytically central and analytically meaningful.

We also examined associations between Bechdel passage and study characteristics, including research design, participant demographics, and use of theory. Together, these analyses surfaced patterns in how women's experiences have been represented in engineering education research and highlighted priorities for future work aimed at more fully capturing the diversity and complexity of women's experiences across the engineering ecosystem.

Findings and Discussion

Applying the adapted Bechdel-inspired analytic framework to the final set of 102 *Journal of Engineering Education* articles showed that 31 studies met the criteria for Bechdel test "passage." These articles centered women's experiences as a primary focus of inquiry and examined such experiences in relation to one another and to engineering contexts, rather than positioning women primarily in comparison to men. The remaining studies, while often attentive to gender, did not meet the adapted criteria because women's experiences were framed comparatively or treated as a subgroup within broader analyses. **Table 3** summarizes shared methodological and representational characteristics across the reviewed articles.

Overall, these findings suggest that while many *JEE* articles engage with gender in some way, fewer studies examine women's experiences noncomparatively. This pattern points to a distinction between *including gender as an analytic variable* and *centering women as subjects of inquiry*. Importantly, passage of the adapted Bechdel test should not be interpreted as an indicator of research quality or rigor. Rather, it offers insight into how women are positioned within studies and how gender is operationalized within engineering education research.

Table 3

Summary of methodological and representational characteristics across Journal of Engineering Education articles

Characteristic	Category	All Articles (n = 102)	Passed Bechdel Test (n = 31)	Did Not Pass Bechdel Test (n = 71)
Methodology	Quantitative	49	6	43
	Qualitative	51	23	28
	Mixed Methods	2	2	0
Study Design	Case Study	6	6	0
	Phenomenology	16	12	4

Characteristic	Category	All Articles (n = 102)	Passed Bechdel Test (n = 31)	Did Not Pass Bechdel Test (n = 71)
	Ethnography	21	5	16
	Survey	59	8	51
Participant Composition	Women only	20	19	1
	Women and nonbinary	8	4	4
	Men and women	71	8	63
	≥3 genders represented	3	0	3
Theoretical Framework	Social Cognitive Career Theory	10	6	4
	Social Identity Theory	6	4	2
	Critical Theories	8	5	3
	Other	24	7	17
	Did Not Specify	54	11	43

Methodological Patterns

Clear patterns emerge when examining methodological differences. Qualitative studies were substantially more likely to “pass” the Bechdel test (23 of 51) compared to quantitative studies (6 of 49). Mixed methods studies, though few in number, all met the criteria for “passing” the Bechdel test (2 of 2). This distribution suggests that methodological approach is closely related to how women’s experiences are represented. Qualitative and mixed methods designs may be particularly well suited to centering women’s voices, as they often emphasize lived experience, narrative, and situational context.

Many of the quantitative studies operationalized gender as a categorical variable, particularly those drawing from large-scale survey data. Analyses are therefore often structured around comparisons across groups, which can make it more difficult to examine women’s experiences independently or in relation to one another. At the same time, this pattern reflects dominant analytic practices rather than inherent limitations of quantitative methods. Approaches such as Critical Quantitative Inquiry (CritQuant) [38] demonstrate how quantitative methods can still be used to center marginalized experiences and examine structural inequities in engineering education (e.g., [39], [40]).

A similar pattern is evident in study design. Case studies and phenomenological studies were far more likely to “pass” the adapted Bechdel test, with all case studies (6 of 6) and a majority of phenomenological studies (12 of 16) meeting the criteria. In contrast, survey-based studies, which comprised the largest proportion of the dataset (59 of 102), rarely “passed” (8 of 59). This pattern suggests that dominant research designs in the field are more often aligned with identifying group-level trends than with examining relational or within-group experiences.

Participant Composition and Gender Framing

Studies that included women-only samples overwhelmingly “passed” the adapted Bechdel test (19 of 20), while studies including both men and women were far less likely to “pass” (8 of 71). Notably, none of the studies that included three or more gender categories met the criteria (0 of 3). This finding suggests that increased demographic inclusivity does not necessarily translate to representational centering. Instead, when multiple gender groups are included, analyses often default to comparative frameworks, positioning men as the implicit “reference group.”

These results point to an important tension: efforts to broaden participation and include diverse identities may still reproduce dominant analytic norms if gender is primarily treated as a variable for comparison rather than as a lens for understanding lived experience. In this sense, representational centering requires attention to both who is included in a sample and how their experiences are taken up in analysis and interpretation.

The Role of Theory

Articles drawing on Social Cognitive Career Theory, Social Identity Theory, and critical theories all showed relatively higher rates of Bechdel test “passage” ($\geq 60\%$). However, no single framework category consistently resulted in “passage.” Still, these patterns suggest that studies grounded in established theoretical frameworks, particularly those that engage with identity, experience, or structural conditions, may be more likely to support analyses that center women’s experiences and situate them within broader sociocultural contexts.

In contrast, a substantial proportion of articles (54 of 102) did not specify a theoretical or conceptual framework, and very few of these studies passed the adapted Bechdel test (11 of 54). However, it is worth noting that the majority of the studies that did not specify a theoretical or conceptual framework were published before 2016. This pattern may reflect shifts in the field toward greater attention to theoretical grounding in more recent work, which in turn may support more nuanced and relational analyses of women’s experiences.

A Note on “Passing” vs. “Not Passing” the Bechdel Test

Importantly, the distinction between articles that “pass” and “do not pass” the adapted Bechdel test should not be taken as evaluative of quality. Many studies that did not “pass” still make important contributions to understanding gender disparities, particularly in documenting differences in outcomes or experiences across groups. However, the findings highlight how

comparative framings remain dominant, often positioning men as the implicit norm and women as a deviation from that norm.

Implications for Engineering Education Research

Taken together, these findings suggest that representational choices in engineering education research shape not only what is known about women in engineering, but also how women's experiences are legitimized as objects of scholarly inquiry. The prevalence of comparative framings highlights the need for greater methodological and theoretical diversity, particularly approaches that center women's voices and attend to structural and cultural conditions rather than individual difference. This scoping review contributes a meta-level perspective on gender research in engineering education and offers a starting point for reflecting on how research questions, study designs, and analytic frames either enable or constrain attention to women's experiences.

Limitations and Future Work

As with any scoping literature review, this study is shaped by deliberate methodological boundaries that influence the scope and interpretation of the findings. To maintain a feasible and focused review, we limited the dataset to publications in the *Journal of Engineering Education*. While this decision allowed for a systematic and in-depth analysis of a flagship journal in the field, it excludes relevant scholarship published from other engineering education journals, conference proceedings, interdisciplinary outlets, and gray literature sources (e.g., doctoral dissertations). Expanding the review to include additional venues may yield different distributions of topics, methods, and representational patterns.

We also restricted the types of publications included in the review, excluding literature reviews, meta-analyses, instrument development papers, and editorials. Although this decision supported analytic consistency, including other publication types could surface additional perspectives on how women's experiences are synthesized, interpreted, and framed within the field. Broadening both the range of publication venues and document types would increase the size and diversity of the dataset, potentially strengthening the robustness of observed patterns and offering a more comprehensive view of how women's experiences are represented in engineering education research.

Future work could extend this analysis to include conference proceedings from the American Society for Engineering Education (ASEE), including the ASEE Annual Conference, the Conference for Research on Equity and Sustained Participation in Engineering, Computing, and Technology (CoNECD), and the Frontiers in Education (FIE) Conference. Because these venues are sponsored by the same professional organization as the *Journal of Engineering Education*, they represent closely aligned but distinct publication contexts within engineering education research. Examining these proceedings would enable comparison of how women's experiences are represented across journals and conferences operating under a shared organization.

Conclusions

This scoping literature review examined how women's experiences have been represented in *Journal of Engineering Education* publications over the past 25 years using an adapted Bechdel-inspired analytic framework. Our findings show that fewer than one-third of the reviewed articles centered women's experiences in ways that avoided comparative framing, despite the journal's longstanding engagement with gender-related topics. These findings suggest that how gender is analyzed remains as important as whether it is included. Expanding approaches that center women's experiences independently may support more comprehensive understandings of engineering education.

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