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# Shaping Engineering Identities: Understanding the Challenges and Influences Impacting Young Women's Participation in Engineering

**Ms. Leah Austin, University of New Haven**

Leah Austin is Coordinator for the Women in Engineering Program at the University of New Haven. She holds a bachelor's degree in computer science from Quinnipiac University. Her research focuses on K–12 STEM outreach and the development of programs designed to enhance the recruitment and retention of underrepresented groups in STEM disciplines.

**Dr. Stephanie M Gillespie, University of New Haven**

Stephanie Gillespie serves as the Associate Dean of the Tagliatela College of Engineering at the University of New Haven. She coordinates the first semester engineering course and support various college level initiatives included recruitment, retention, advising, assessment, curriculum, and more. She previously specialized in service learning while teaching at the Arizona State University in the Engineering Projects in Community Service (EPICS) program. She has stayed active in engineering education research and has explored research questions related to makerspaces, service learning, faculty development, entrepreneurial mindset, and women in engineering.

**Bethel Yohannes Wodajo, University of New Haven**

Bethel Wodajo is a master's student in Biomedical Engineering at the University of New Haven and holds a bachelor's degree in Electrical and Electronics Engineering from the United Arab Emirates University. Her interests span biomedical innovation, engineering education, and increasing participation of women in STEM fields. This paper reflects her interest in understanding how identity, recognition, and educational experiences shape young women's pathways into engineering.

# Shaping Engineering Identities: Understanding the Challenges and Influences Impacting Young Women's Participation in Engineering

## Introduction

By 2030, Connecticut's engineering sector is estimated to grow by over 20%, creating more than 4,500 new jobs yearly [1]. However, the state struggles to meet this demand, resulting in only about 1,050 engineering graduates per year at its largest engineering institution, with women representing less than 25% of undergraduate engineering students [2]. This gender imbalance not only reflects systemic inequities but also represents a loss of potential talent and innovation in a field critical to economic development [3].

The marginalization of women in engineering cannot be explained solely by differences in academic performance or interest. Instead, it is increasingly understood through the lens of identity, whether students can imagine themselves as belonging in engineering [3][4]. Perceptions of engineering as highly technical, male-dominated, and culturally exclusive can discourage capable young women long before they ever reach college [3]. Hence, identity formation is central to persistence in STEM fields: students must not only be competent but also be recognized and see themselves as future engineers [5].

With most STEM-identity studies focused on undergraduate populations, there is a significant gap in understanding how engineering identities are shaped or disrupted during high school, a formative period for academic and career decision-making. Stereotypes and misconceptions that appear during this stage can solidify into barriers that hold back girls from ever considering engineering as a possible path [6].

This study addresses this gap by examining what makes engineering feel possible or impossible for high school students. Based on the Science Identity Framework by Carlone and Johnson [5], and its adaptation to engineering contexts [3], the study explores how competence, interest, and recognition intersect with gendered experiences in shaping students' understanding of engineering. Using qualitative data from semi-structured, one-on-one video interviews conducted through the Women in Engineering outreach program at the University of New Haven, this research aims to identify key barriers and supports that influence identity development and to inform strategies that promote a more inclusive engineering culture in secondary schools. This study sets out to answer the following question. What are the main supports and barriers for high school women developing their engineering identity in Connecticut?

## Literature Review

*Engineering Identity: From Framework to Measurement*

Carlone and Johnson's [5] seminal framework for science identity centers on three dimensions: competence (knowledge and understanding), performance (demonstration of scientific practices), and recognition (being acknowledged by oneself and others as a science person). Their ethnographic research with women of color in science revealed that without recognition, even highly competent and high-performing students failed to internalize science identities, resulting in identity disruption or attrition.

Schmader and Sedikides' State Authenticity as Fit to the Environment (SAFE) framework describes how social identities motivate or deter people from certain situations by either propelling them to areas they feel they belong, or distancing themselves from places that feel alienating [7]. While this framework has been used to develop interventions that encourage young female students to see their future in STEM [8], this study preferred to use a framework more focused on Engineering Identities.

Building on Carlone and Johnson's framework, Patrick developed an Engineering Identity Scale to measure these identity components in undergraduate populations, shown visually in Figure 1 [3]. Their study of over 470 engineering students found that recognition and interest were stronger predictors of engineering identity and persistence than competence or performance. Notably, women reported lower self-efficacy (performance/competence), even when academic achievement was equal, strengthening the importance of early identity development for retention.

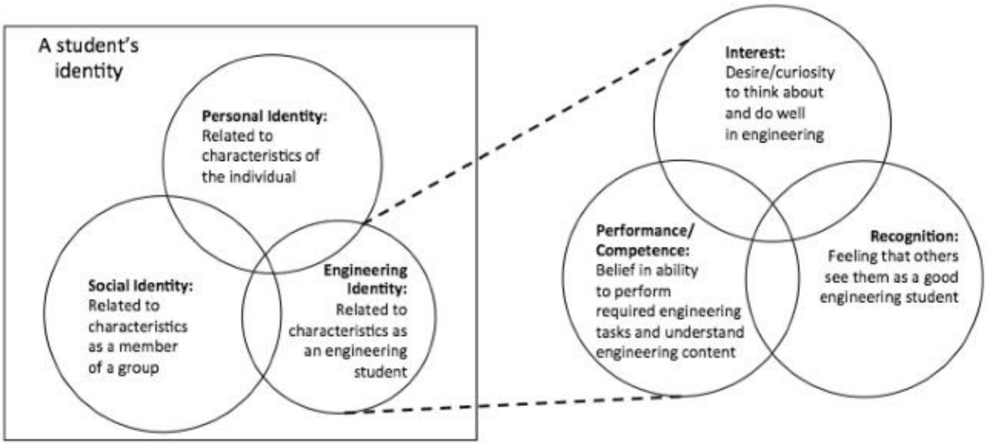


Figure 1 – from Patrick's *Predicting Persistence in Engineering through an Engineering Identity Scale Figure 1* [3]

*Engineering Identity Formation in High School Contexts*

While Carlone and Johnson's science identity framework [5] and Patrick's engineering identity scale [3] have primarily been applied in postsecondary contexts, a growing body of K–12 research shows that identity formation begins much earlier, often solidifying by high school. A recent systematic review of engineering identity research in pre-college education found that students who do not see themselves as potential engineers by early adolescence are unlikely to pursue engineering careers later, regardless of academic ability [9]. This creates a critical pipeline gap, as most interventions and measurements of engineering identity occur only after students have already made key academic and career decisions.

Hazari's [10] national study of 3,829 college students demonstrated that high school classroom experiences are among the strongest predictors of a future physics career. Their identity model included performance, competence, recognition, and interest, mirroring the Carlone and Johnson framework. Students who experienced conceptual instruction, real-world applications, teacher encouragement, and opportunities to speak and lead in class developed stronger physics identities, which in turn predicted their likelihood of choosing a STEM career. Although these experiences benefited both genders, female students reported receiving them less often, contributing to weaker identity development.

Godwin further advances identity-based explanations of engineering career choice through the Critical Engineering Agency (CEA) framework [11], which integrates students' math and physics identities with their beliefs about using science and engineering to improve the world. Using a nationally representative sample of 6,772 first-year college students and structural equation modeling, the study demonstrates that recognition from teachers, parents, and peers is the strongest predictor of both math and physics identity, outweighing performance or competence beliefs alone. Importantly, the authors found that performance and competence beliefs, when not mediated by interest and recognition, can negatively predict subject-related identity, highlighting that academic ability alone is insufficient for sustaining pathways into engineering. Physics and math identities measured at the beginning of college explained approximately 20% of the variance in students' likelihood of choosing engineering as a career, underscoring the significance of identity formation prior to formal exposure to engineering coursework. Gender-based analyses revealed that women reported lower recognition and weaker identity beliefs despite comparable academic preparation, while agency beliefs, particularly the perception that science and engineering can contribute to positive social change, were more predictive of engineering choice for women than for men. These findings reinforce the argument that gender disparities in engineering are driven less by differences in ability and more by differential recognition, identity development, and value alignment, emphasizing the need for early, identity-affirming interventions during high school education.

These findings are especially relevant to Connecticut, where high school pathways play a decisive role in shaping students' STEM futures. The Connecticut technical high school system enrolls more than 11,000 students per year, representing over 7% of all high school students statewide, with 31% coming from Bridgeport, Hartford, New Haven, New London and Waterbury, Connecticut's highest-poverty districts [12]. A large-scale longitudinal study of technical high school system applicants found that while male students experienced significant gains in graduation rates and earnings after attending technical high schools, female students saw little or no benefit, suggesting that access to STEM-related coursework alone is insufficient to alter identity-driven career pathways for young women. [12]

*Recognition as a Predictor of Persistence*

Martin-Hansen [4] reviewed multiple longitudinal studies and confirmed that recognition is essential for persistence in STEM fields. They observed that internal factors like self-efficacy and external factors like mentorship and peer validation together shape identity. Girls frequently recorded lower science identity scores than boys during middle and high school years, despite comparable achievement, suggesting that recognition is not just an outcome, but a precursor of STEM persistence.

Similarly, Patrick and Borrego [13] synthesized 55 studies and found that recognition, especially from teachers and mentors, was the most influential factor for women choosing and persisting in engineering. Their review drew attention to how identity is both constructed through relationships and shaped by institutional cultures that either validate or negate students' sense of belonging.

*Gendered Misrecognition and Engineering Stereotypes*

A recurring theme in identity research is the cultural misrecognition of engineering as masculine, mechanical, and isolating. Carlone and Johnson [5] described instances where women were subtly or explicitly misrecognized, including being excluded from labs, denied mentorship, or accused of misconduct. These social barriers often outweighed academic factors in undermining science identity development.

Two outreach programs, e-Camp (mixed-gender) and e-Girls (female-focused), were compared and evaluated by Nadelson and Callahan [6]. Their paper found that the latter significantly improved engineering attitudes among girls. The most effective aspects of e-

Girls included mentorship by women engineers and hands-on projects with social relevance. These elements challenged stereotypes and enhanced recognition, allowing the engagement of the female participants to "see themselves" in engineering roles.

*Gender Differences in Mathematics Achievement*

A common assumption underlying gender disparities in engineering is that they stem from differences in mathematical ability. However, extensive research contradicts this deficit-based explanation. Large-scale studies consistently show that gender differences in average mathematics performance are small or non-existent, particularly in middle and high school. In many contexts, girls outperform boys in teacher-assigned math grades, reflecting stronger academic behaviors such as persistence, homework completion, and classroom engagement [14]. Despite this academic advantage, girls remain underrepresented in advanced mathematics pathways and mathematically intensive careers. Longitudinal evidence from high-achieving populations reveals that gender gaps widen not at the level of average performance, but among top performers. Ellison and Swanson's analysis of students participating in elite mathematics competitions demonstrates that a substantial gender gap is already present by ninth grade and continues to widen throughout high school [15]. Their findings indicate that fewer girls make the large year-to-year gains necessary to remain among the highest-ranking students, a pattern influenced by differential responses to competition, discouragement, and dropout following perceived failure.

These findings are particularly important because they show that academic competence alone does not guarantee continued participation in advanced mathematics. Even among students who initially demonstrate high achievement, social and psychological factors shape persistence. Girls are more likely to disengage after narrowly missing performance thresholds, suggesting that confidence, recognition, and responses to academic setbacks play a decisive role in sustaining high-level participation.

This divergence between mathematical achievement and persistence underscores the centrality of recognition in identity formation. Without consistent affirmation from teachers, peers, and institutions, girls who are objectively successful in mathematics may fail to internalize a "math person" identity. This identity gap limits access to advanced coursework, enrichment opportunities, and ultimately engineering pathways.

State-level data from Connecticut reinforce the disconnect between mathematics achievement and gendered STEM participation. The 2024 NAEP data indicate no statistically significant difference ($p > .05$) between eighth-grade girls' and boys' average mathematics scores in Connecticut, demonstrating equivalent quantitative achievement (proficiency rates) prior to high school [16].

Despite this equivalence, women remain significantly underrepresented in engineering pathways across the state. At Connecticut's largest engineering institutions, women comprise less than one-quarter of undergraduate engineering students [2], even as demand for STEM professionals continues to grow. This contrast highlights that gender disparities in engineering are not rooted in mathematical ability, but rather in how competence is recognized, supported, and translated into identity during secondary education.

These findings suggest that Connecticut's gender gap in engineering reflects broader identity-based and structural barriers rather than academic shortcomings. Understanding how recognition, encouragement, and representation function within Connecticut high schools is, therefore, essential for addressing inequities in engineering participation

*The Impact of Mentorship and Educational Climate*

Mentorship has appeared as a powerful tool for shaping STEM identity. Students receiving instrumental and socioemotional mentoring developed stronger science identities. Students exposed to recognition, encouragement, and role models displayed higher persistence across gender and racial lines [4].

Educational climate further influences recognition and identity. Students at institutions with visible female STEM faculty, inclusive pedagogies, and identity-affirming curricula were more likely to form sustainable engineering identities [13]. In contrast, environments dominated by masculine norms (e.g., lab toughness, competitiveness) were found to wear away the belonging of female students.

*Family, School, and Social Influences on STEM Career Choice*

Identity formation is shaped not only by classroom experiences but also by family, peers, and school influences. Kauffmann [17] studied 94 high-potential high school students in a STEM summer academy and found that family expectations, peer encouragement, school climate, and media exposure significantly influenced whether students considered STEM careers viable options. Female students reported that family support and role models played a decisive role in whether they could imagine themselves pursuing engineering, whereas a lack of teacher encouragement or school support discouraged even interested students.

*Structural Constraints and Pipeline Gaps*

At the structural level, the gender gap in engineering is reflected in both educational and labor market outcomes. The University of Connecticut's number of engineering degrees has generally remained flat, with a slight decline in bachelor's conferrals in 2025. With women comprising only 24–25% of graduates, the gender imbalance persists despite increasing STEM labor demand [2]. The Connecticut Department of Labor estimates over 10,000 STEM job openings each year [1]; however, the current graduation rates, mainly among women, fall far short of meeting this target. This difference indicates how identity-based obstacles have real economic consequences.

Patrick and Borrego [13] explain that engineering identity is not merely a psychological setup; it is a predictive variable linked to major choice, persistence, and career entry. For young women, engineering identity development is often diminished due to a lack of recognition, interest misalignment, or stereotype threat.

*Engineering Identity as a Site of Intervention*

The literature cited in this paper suggests that the interventions must begin early and address both the internal and external dimensions of identity. Patrick [3] states that engineering identity is formed through performance, competence, and recognition; however, it endures through interest and social support. Similarly, Nadelson and Callahan [6] explained that brief, well-designed outreach programs can significantly improve engineer attitudes among adolescent girls. Carlone and Johnson [5] contended that identity is an inconsistent trait, a dynamic process influenced by cultural narratives, classroom practices, and relational interactions. Therefore, schools and STEM programs must actively remodel the "story" of engineering to boost creativity, collaboration, and societal impact values that align with many girls' interests.

## Methods

*Study Design*

This study used a qualitative research study to explore high school students' perceptions of engineering and barriers to developing their engineering identities. Semi-structured, one-on-one interviews were conducted to determine students' experiences in their own words, and framework analysis was used to interpret the data [18].

*Recruitment Procedures*

Recruitment was conducted through a statewide outreach campaign targeting STEM educators. Contact information for 3,455 Connecticut STEM teachers was obtained through publicly available sources. These teachers were already a part of the Women in Engineering list serve. 2,839 opted in, and 907 opened the specific email containing recruitment materials. Teachers were asked to share the study invitation with eligible students in two different waves. The first recruitment wave was limited to female-identifying students in grades 9 to 12 attending a Connecticut school, while the second wave included male-identifying students in the same grade range. 84 female students initially responded, of whom 46 completed the consent process and interviews. 35 male students responded in the second wave, and 17 completed interviews. Prior to the interview, students verified their gender, high school, and intended career choice. No students declined to disclose their gender. All participants received a $50 Amazon gift card upon completion of the interview.

*Participants*

A total of 63 students completed interviews. The first recruitment wave yielded 46 female-identifying students in grades 9 to 12 attending Connecticut schools. A second recruitment wave yielded 17 male-identifying students in grades 9 to 12, who served as a comparison group. Participants represented 33 schools across Connecticut. Table 1 summarizes the composition of the sample student body from these schools across several key characteristics, specifically looking at school type, public vs private, school gender composition, coed vs girls only, district poverty status, and district math performance based on CT's Smarter Balance Assessment [20]. These characteristics are used to describe variation in the educational experiences across the state. The schools where participants attended represent the full spectrum of student educational experiences.

Table 1: School Type and Data from Schools Represented by Students Interviewed

| | *Category* | *Count* | *Percentage* |
|---|---|---|---|
| *School Type (* Private schools = 33% of all CT high schools)* | Public | 21 | 64% |
| | Private | 12 | 36% |
| *School Gender Composition (* Coeducational = 95% of all CT high schools)* | Coeducational | 30 | 91% |
| | Female only | 3 | 9% |
| | Male only | 0 | 0% |
| *School District Poverty Status (** State Average = 10% in 2023)* | At or below state poverty level | 13 | 39% |
| | Above state poverty level | 20 | 61% |
| *Math Performance (** State Average = 44% in 24-25)* | Below state average | 16 | 49% |
| | Above state average | 17 | 51% |

* Public school data is from 23-24. Private school data is from 21-22*[19]*

** Based on CT's Smarter Balance Assessment *[20]*

*Ethical Considerations*

This study received approval from the university's Institutional Review Board. All participants completed an online consent form prior to participation. For students under the age of 18, a parent or guardian also completed a corresponding consent form. Interviews were conducted via a password-protected Zoom link in a private, one-on-one session with the PI.

Only the PI had access to raw personal information and interview recordings. Recordings were initially processed using Zoom's auto-generated closed captioning system. All transcripts were manually edited to remove identifying information (names, school names, locations, etc.) and ensure accuracy to the audio recording before being shared with the research team.

*Interview Procedures*

Interviews were designed to last approximately 15 minutes, with actual durations ranging from 10 to 20 minutes. The PI served as the sole interviewer. A semi-structured script guided each session, asking questions for the following areas:

- Students' general awareness of engineering careers
- Students' perceived school support related to engineering
- Students' perceived challenges to pursuing engineering
- Social influences and stereotypes
- Suggested strategies for improving access to engineering

Two versions of the scripts were prepared based on whether students did or did not see engineering as a potential career path to ensure question modality was clear (i.e. What factors have influenced your decision (not) to pursue engineering?). While interviews generally followed the predetermined script, the PI would skip or expand upon questions as appropriate. Questions were designed to cover a holistic view of student experiences. See Appendix 2 for the full list of interview questions.

*Interview Coding*

A hybrid deductive–inductive framework analysis was conducted. Initial coding categories were derived from Carlone and Johnson's [5] science identity framework and the Engineering Identity Scale [3]. Additional codes were developed inductively during analysis to capture emergent concepts, such as school-provided resources, including career counseling and classwork.

The coding team consisted of four researchers. To establish reliability, the team pilot-tested the preliminary coding scheme, engaged in consensus discussions, refined code definitions, and re-tested the scheme twice before full coding began. Preliminary coding was done on 5 interviews, 7 in the second round, and 4 in the third round. Table 2 shows the intercoder reliability as measured by Fleiss' Kappa improves significantly during the codebook evolution process, increasing from 0.423 to 0.710. Once the codebook was finalized, each reviewer was assigned 20 interviews to code, with 4 interviews overlapping for intercoder reliability.

Table 2: Intercoder Reliability using Fleiss' Kappa after each Calibration stage

| | | | |
|---|---|---|---|
| Calibration 1 = 0.423 | p-value = <0.001 | 31 codes | 4 coders |
| Calibration 2 = 0.562 | p-value = <0.001 | 48 codes | 4 coders |
| Calibration 3 = 0.710 | p-value = <0.001 | 57 codes | 4 coders |

After concluding the final round of coding, the initial set of 57 codes was reviewed for frequency and overlap. Codes that appeared fewer than 3 times in the dataset were fully removed. Codes that related thematically to other codes were consolidated. Following this condensing process, the coding scheme was reduced to 35 codes for analysis.

Codes were sorted by their high-level categories based on the literature (Competence, Interest, and Recognition) and were labeled as either developing their engineering identity or acting as a barrier to engineering identity based on the expected student perception of that code. For example, code “Engineering is math or science” is expected to be a barrier, while code “Engineers are hands-on” is expected to develop. Some codes did not fit into Carlone and Johnson’s framework but were included due to their high frequency in the interviews. These codes were categorized as “Access” since their nature is more in line with whether a student has access to engineering classes, resources, or clubs at their school.

**Results**

To compare trends and responses across various participant types, interview responses received multiple labels. At the beginning of the interview, participants were categorized as female or male based on their confirmed gender. Additionally, participants were labeled based on what type of career they planned to pursue.  Engineering was used for students who specified any of the traditional engineering disciplines (i.e., Mechanical, Electrical, Chemical, Civil, Software, or Industrial). Engineering Related was assigned for any field that is closely related to engineering (i.e., Computer Science, cybersecurity). Non-Engineering was assigned to participants who indicated any specific career interest besides engineering or engineering-related. If a student had not decided on a career path, they were labeled as undecided.  Table 3 shows the overall participant labels.

Table 3: Participants' Demographics and Type

| | Engineering | Engineering Related | Non-Engineering | Undecided | Total |
|---|---|---|---|---|---|
| Female | 7 | 6 | 28 | 5 | 46 |
| Male | 10 | 0 | 4 | 3 | 17 |

Participants were categorized into two groups based on their expressed career intentions. Students who indicated interest in pursuing an engineering degree or a closely related field were classified as Engineer, while those who reported non-engineering career plans or were undecided were classified as Non-Engineer.

**Analysis**

In order to begin examining the research question relating to student identity-forming characteristics for high school students in the state of Connecticut, we examined the relationship between students' gender and engineering interest and the four high-level categories (Access, Competence, Interest, and Recognition). Table 4 shows the detailed frequency of the codebook results, grouped by categories, for each of the main participant labels (Engineer and Non-Engineer) by gender.

Table 4: Frequency of codes (See Appendix for Full Codebook)

| | | | Engineer | | Non-Engineer | |
|---|---|---|---|---|---|---|
| High Level | Detail Code | Code Description | F (n=13) | M (n=10) | F (n=33) | M (n=7) |
| Access Barrier | A.B.1 | Engineering isn't accessible | 4 | 1 | 5 | 3 |
| | A.B.2 | Didn't take Engineering classes/clubs offered | 0 | 0 | 3 | 1 |
| | A.B.3 | Guidance doesn't have Engineering resources | 3 | 1 | 14 | 2 |
| | A.B.4 | Guidance doesn't support career discovery | 1 | 0 | 6 | 0 |
| | A.B.5 | School doesn't offer Engineering classes/clubs | 1 | 1 | 5 | 3 |
| | A.B.6 | Student doesn't have exposure or role models | 11 | 3 | 21 | 5 |
| Access Developed | A.D.1 | Engineering is accessible | 7 | 9 | 6 | 1 |
| | A.D.2 | Student takes Engineering classes | 8 | 2 | 8 | 1 |
| | A.D.3 | Guidance does have Engineering resources | 10 | 4 | 8 | 2 |
| | A.D.4 | Guidance does support career discovery | 6 | 2 | 6 | 1 |
| | A.D.5 | School offers Engineering classes/clubs | 11 | 8 | 19 | 2 |
| | A.D.6 | Aware of different engineering fields | 6 | 4 | 13 | 3 |
| Competence Barrier | C.B.1 | Bad at math or science | 2 | 1 | 8 | 0 |
| | C.B.2 | Engineering is too difficult | 3 | 7 | 12 | 2 |
| Competence Developed | C.D.1 | Good at math or science | 1 | 3 | 6 | 1 |
| | C.D.2 | Willing to learn | 2 | 2 | 2 | 0 |
| Interest Barrier | I.B.1 | Engineers must be naturally smart | 4 | 7 | 15 | 3 |
| | I.B.2 | Engineering is math or science | 6 | 10 | 22 | 3 |
| | I.B.3 | Dislikes math or science | 0 | 0 | 5 | 0 |
| | I.B.4 | Engineering rigor limits pursuing other interests | 3 | 1 | 2 | 2 |
| | I.B.5 | Engineering is construction or labor | 2 | 1 | 11 | 1 |
| | I.B.6 | Engineers work at a desk / computer | 4 | 1 | 4 | 1 |
| Interest Developed | I.D.1 | Engineering skills can be learned | 3 | 2 | 8 | 3 |
| | I.D.2 | Engineers solve problems creatively as a team | 5 | 8 | 15 | 5 |
| | I.D.3 | Enjoys math or science | 3 | 3 | 11 | 1 |
| | I.D.4 | Engineers are focused/passionate | 3 | 4 | 7 | 1 |
| | I.D.5 | Engineering can help the world | 2 | 6 | 3 | 0 |
| | I.D.6 | Engineers are hands-on | 3 | 3 | 6 | 3 |
| Recognition Barrier | R.B.1 | Engineering in media | 3 | 3 | 3 | 1 |
| | R.B.2 | Student dislikes being in male-dominated field | 10 | 2 | 27 | 1 |
| | R.B.3 | Doesn't know someone in Engineering | 2 | 1 | 5 | 0 |
| | R.B.4 | Women's expectations to pursue soft careers | 6 | 0 | 30 | 1 |
| Recognition Developed | R.D.1 | Knows someone in Engineering | 10 | 4 | 15 | 3 |
| | R.D.2 | Aware of more women in Engineering | 2 | 0 | 6 | 0 |

For each participant, average scores were calculated for each high-level category in our framework: Access (Developed and Barrier), Competence (Developed and Barrier), Interest (Developed and Barrier), and Recognition (Developed and Barrier). These scores were used in a correlation analysis to determine the association between career interest (engineers vs. non-engineers) and each high-level category, separated by gender. Areas with |r| >=0.4 were identified, and a two-tailed t-test between each of the high-level categories and engineering career interest was performed to ensure significance.

Results are shown in Table 5, with statistically significant results highlighted in bold text. In this context, it is expected to see a positive correlation between students who want to pursue engineering and the codes in the developed categories and a negative correlation between students who want to pursue engineering and the codes in the barrier categories. This indicates that Engineer students are more inclined to mention the codes that developed their engineering identity, and not mention codes that acted as a barrier to their engineering identity.

Table 5 - Correlations between category and career interest, by gender. Bolded values indicate |r|>0.4

| | Correlation between category and Career Interest | | P-Value | |
|---|---|---|---|---|
| Category | *F* | *M* | *F* | *M* |
| Access Barrier | -0.04 | **-0.63** | 0.3951 | 1.50E-06 |
| Access Developed | **0.51** | **0.71** | 0.0002 | 1.34E-08 |
| Competence Barrier | -0.16 | **0.42** | 0.1410 | 0.002 |
| Competence  Developed | -0.01 | 0.30 | 0.4677 | 0.022 |
| Interest Barrier | -0.15 | 0.28 | 0.1642 | 0.029 |
| Interest Developed | -0.02 | 0.24 | 0.4485 | 0.054 |
| Recognition Barrier | -0.19 | 0.11 | 0.0986 | 0.236 |
| Recognition Developed | 0.20 | -0.03 | 0.0923 | 0.425 |

The process for calculating correlation and significance was repeated at the singular code level to provide a more detailed view of the results. The results of the code-level correlation are shown in Table 6.

For female students, only one high-level category is strongly correlated with a career interest in engineering. Access developed, with a r = .51 and p-value of 0.0002. No other category was found to be significant. From the results, high school females' desire to pursue an engineering or related degree is moderately correlated to their access to engineering support while in high school, namely, taking engineering classes or participating in engineering clubs. This is shown in Table 6 with two code elements, A.D.5- School offers Engineering classes/clubs and Code A.D.2- Student takes Engineering classes, which were the most coded elements by this group of students, although not individually correlated. Additionally, it can be seen that these students often took advantage of engineering resources provided by their guidance or career counselor (A.D.3- Guidance does have Engineering resources). Female students interested in an engineering career also tend to be less inclined to mention the careers pursued by women historically, and the social norms to enter "soft" fields (R.B.5-Women's societal expectations to pursue soft careers).

Table 6: Detailed Correlation between code-elements and career interest, by gender. Bolded values indicate |r|>0.4 (Code Descriptions are in Table 4)

| | **Correlation between category and Career Interest** | | **P-Value** | |
|---|---|---|---|---|
| | *F* | *M* | *F* | *M* |
| A.B.1 | 0.18 | -0.38 | 0.304 | 0.179 |
| A.B.2 | -0.17 | -0.30 | 0.083 | 0.356 |
| A.B.3 | -0.18 | -0.24 | 0.208 | 0.398 |
| A.B.4 | -0.13 | n/a | 0.315 | n/a |
| A.B.5 | -0.10 | -0.38 | 0.460 | 0.179 |
| A.B.6 | 0.21 | -0.41 | 0.130 | 0.107 |
| A.D.1 | 0.36 | **0.76** | 0.038 | 0.001 |
| A.D.2 | 0.35 | 0.07 | 0.030 | 0.774 |
| A.D.3 | **0.49** | 0.12 | 0.001 | 0.650 |
| A.D.4 | 0.29 | 0.07 | 0.096 | 0.774 |
| A.D.5 | 0.26 | **0.51** | 0.056 | 0.044 |
| A.D.6 | 0.06 | -0.03 | 0.691 | 0.914 |
| C.B.1 | -0.10 | 0.21 | 0.498 | 0.343 |
| C.B.2 | -0.13 | 0.41 | 0.379 | 0.107 |
| C.D.1 | -0.13 | 0.18 | 0.315 | 0.464 |
| C.D.2 | 0.15 | 0.31 | 0.419 | 0.168 |
| I.B.1 | -0.13 | 0.27 | 0.367 | 0.305 |
| I.B.2 | -0.19 | **0.66** | 0.231 | 0.030 |
| I.B.3 | -0.22 | n/a | 0.023 | n/a |
| I.B.4 | 0.25 | -0.24 | 0.206 | 0.398 |
| I.B.5 | -0.18 | -0.07 | 0.189 | 0.810 |
| I.B.6 | 0.22 | -0.07 | 0.217 | 0.810 |
| I.D.1 | -0.01 | -0.25 | 0.936 | 0.365 |
| I.D.2 | -0.06 | 0.10 | 0.677 | 0.713 |
| I.D.3 | -0.10 | 0.18 | 0.493 | 0.464 |
| I.D.4 | 0.02 | 0.28 | 0.896 | 0.254 |
| I.D.5 | 0.09 | **0.62** | 0.594 | 0.005 |
| I.D.6 | 0.06 | -0.13 | 0.729 | 0.621 |
| R.B.1 | 0.19 | 0.18 | 0.304 | 0.464 |
| R.B.2 | -0.06 | 0.07 | 0.729 | 0.774 |
| R.B.3 | 0.00 | 0.21 | 0.985 | 0.343 |
| R.B.5 | **-0.49** | -0.30 | 0.010 | 0.356 |
| R.D.1 | 0.28 | -0.03 | 0.046 | 0.914 |
| R.D.2 | -0.03 | n/a | 0.824 | n/a |

For male students, 2 high-level categories strongly correlated with a career interest in engineering, Access Developed ($r = 0.71$, p-value = 1.34E-08) and Competence Barrier ($r = 0.42$, p-value = 0.002), and one category that has a strong negative correlation, Access Barrier ($r = -0.63$, p-value = 1.50E-06). No other category was found to be significant. High School males who wanted to pursue an engineering degree also benefit from their school's engineering classes and clubs (A.D.5- School offers Engineering classes/clubs). However, they also tend to believe that engineering is a field anyone can get into if they desire (A.D.1- Engineering is accessible), that engineering is closely related to math and science (I.B.2- Engineering is math or science), and that engineering can help improve the world (I.D.5- Engineering can help the world).

This also highlights an unexpected result where boys who are interested in pursuing an engineering career also had a strong correlation with a barrier code, I.B.2- Engineering is math or science, which was assumed to block developing a student's engineering identity. This result indicates that for young men, engineering's close affiliation with math and science helps to develop their engineering identity.

Note that none of the male participants were coded positively for code elements A.B.4 (Guidance doesn't support career discovery), I.B.3 (Dislikes Math or Engineering), or R.D.2 (Aware of more women recently pursuing engineering), which shows as n/a in Table 6.

**Discussion**

This study set out to examine how engineering identities are developed in high school, with a focus on the experiences of female-identifying students. The results showed that access to engineering resources within their school is foundational to the formation of an engineering identity. Female students who expressed interest in engineering often described pathways that began with early exposure through engineering classes, clubs, and other structured opportunities that allowed them to explore STEM in sustained ways.

For example, one student (P36), who planned to pursue computer science, described her pathway as emerging from repeated exposure to engineering-related activities:

> *"I was…exploring a bunch of things…deciding, 'oh, what should I do?' and around…the end of 8th grade, it kind of hit me that, 'oh, I've been doing a lot of, like, engineering, robotics-related things,'"* adding that her school provided, *"a lot of clubs and activities… a bunch of STEM nights… and those give you exposure."*

Similarly, several students reflected on the impact of consistent engineering opportunities:

> *"I feel like I've been very lucky… my middle school was STEM-focused, and I've had access to…my AP computer science class…so I feel like I've had a lot of support for those things."* (P43, interested in engineering)

> *"We have a lot of, like, courses, selective courses, and our guidance counselors help us, like, every year to, like, select courses that will help us or guide us to our near, our near future and our careers… We have many courses, like, supporting bio, like, biology or, like, the medical field, and also supporting, like, engineering, so I think, yeah, our school really does help support STEM."* (P02, interested in biomedical engineering)

> *"[The School] offers clubs. Like, last year, they offered a lecture, but it was only for girls…They did really good with that, and the classes that they offer, too…Like, I remember freshman year, I took this class called Engineering Design, and that actually, like, influenced me even more to get into engineering, because it was just really fun."* (P11, Interested in Software Engineering)

*"My school's pretty good about having, like, engineering classes, so I'm getting into those. I did a couple of computer science courses in middle school"* (P45, interested in civil engineering)

These accounts exemplify the quantitative moderate correlation between girls' engineering interest with both the availability of engineering courses/clubs and their engagement with them. Some students also recognize that not having access to engineering can make pursuing the field more difficult. One student (P43) stated:

*"I feel like it depends on the resources you have. I feel like I've been very lucky of both of my parents work with engineers or are engineers. And my middle school was STEM-focused, and I've had access to, like, my AP computer science class…But not everyone is going to have that support, and it's going to make it harder."*

These accounts, along with the strong correlation between female students' interest in an engineering career and their access to engineering classes, clubs, and resources, support previous research done by Sonnert and his colleagues [21]. Their study of high school STEM experiences showed that both in-school and out-of-school STEM activities significantly shape students' STEM career interest and identity. This pattern held across gender and shows that access to STEM within the school setting is a critical driver of career interest, especially for populations underrepresented in engineering. Since Carlone and Johnson's framework was based on individuals already enrolled in STEM fields at the university level, access may not have been as relevant to their STEM identity formation.

However, access alone is not sufficient for many female students. Engineering identity development relates to students' experiences of recognition and belonging. Being recognized by teachers and peers helps female students feel they belong in engineering. Several students described the support they received:

*"I will say, like, a lot of my teachers, especially in, like, that teach tech ed and STEM, actually were like, we need more women, and we need more girls to take our classes…I think there are so many organizations that are doing a really good job at…making engineering and STEM fields a lot more accessible and a lot more inclusive towards women...It's for everybody, including women, and I think those organizations are doing a really good job at making it feel more inclusive."* (P23, interested in mechanical engineering)

*"My upperclassmen friends have started an organization in our community, and it's, like, women in STEM. And basically, we just, like, empower women and young women starting from, like, 6th grade and above, and help them, like, get exposure to, like, STEM-related fields and STEM careers. And we have a lot of guest speakers come in from, like, ISEF and, like, Regeneron STS, and…They come in and speak to, like, the girls, and we also do a bunch of, like, STEM activities with the elementary schools. So, I feel like…There is a lot of, like, encouragement, especially for young women in our community."* (P36, interested in computer science)

*"Most of my teachers, especially the STEM teachers, they're always like, oh yeah, like, we need to get more women in STEM, we need to get more women, like, more interested about it. We need to create, like, a safe place for women to feel like, 'yeah, I*

*can also do what a man is doing'. So I do think…There's a lot of, like, upliftment."* (P37, interested in computer science)

In contrast, several girls described discouragement from teachers or peers that ultimately diverted them from engineering pathways. One student (P31) recounted that although she initially considered engineering,

> *"A lot of my teachers were just like, 'you would be the only girl,' kept saying stuff like that, so then I'll just…get a new career path."*

Another student (P11) explained how the gender imbalance in her engineering classes negatively shaped her sense of belonging:

> *"The classes that I'm in, [there's] two other girls… and honestly, that influences how I'm treated. It kind of discourages me from thinking of an engineering career for my future."*

Similarly, one student (P36) described an issue she saw when participating in STEM clubs and classes:

> *"I often…see, like, in clubs, usually when the teacher says, 'oh, you guys can decide amongst yourselves,' I see, like, every time, it's like the boys jump in and they just leave out the girls. The girls often think, 'oh, maybe this isn't meant for me,' and then they often, like, drop out, and it's like, I've seen this happen…I feel they lose interest because they don't really get the opportunity to, like, [be] hands-on, when a teacher isn't there."*

P37 describes stories she heard from her peers who were interested in STEM:

> *"I have heard stories of people being, like, not being able to get the right resources, or showing interest in joining, like, engineering, but being shunned because they're women."*

Despite recognition not being strongly correlated with engineering career choice, these experiences illustrate how recognition barriers directly constrain girls' ability to sustain engineering interest even when access is present. They reinforce the recognition component of Carlone and Johnson's identity framework: students must be seen and treated as future engineers by parents, teachers, and peers before they can see themselves that way.

Female students in the study who were not interested in STEM had awareness of societal norms that led women toward historically "soft" or caregiving fields, and those interested in engineering had to break away from the norm. As one student (P07) described,

> *"In my AP Calculus class… I'm one of three girls… societally, a lot of girls who like humanities will influence their friends to also do humanities. You have to break away from the mold… if you're considering engineering as a girl."*

These findings demonstrate that girls' engineering identities are developed by their environment, shaped by both opportunities to access engineering and by cultural recognition. This echoed the findings of Nadelson and Callahan [6], where female students who frequently related engineering to "nerdy" or physically laborious work distanced themselves from those identities.

In comparison, male high school students who expressed interest in engineering also benefited from exposure to engineering courses and clubs, suggesting that access is a universal factor for interest. However, male participants were more likely to view engineering as accessible to anyone who wants to be an engineer. As P51 stated,

> *"I think it is definitely accessible to younger students."*

When male students did acknowledge barriers to entry, they most often noted economic barriers. P48 explained,

> *"I definitely think in… communities like New Haven, it could be harder for students in lower-income areas."*

The differences between female and male students suggest that while access supports engineering interest for all students, how boys and girls understand engineering is different. Girls' identities are shaped by ideas of belonging, recognition, and gendered expectations, where boys' identities are more closely tied to what engineering is (its relationship to math/science, its societal impact).

Overall, this study extends the literature by suggesting that engineering identity development is influenced by both exposure and the social contexts in which students encounter engineering. Carlone and Johnson's [5] framework was originally developed while studying students and professionals who were already in STEM spaces. Access was already assumed for those participants. In comparison, high school students are limited to the coursework and resources provided by their schools, which can vary greatly from district to district. For female students in particular, supportive learning environments, affirming teachers, and counter-narratives to gendered career expectations appear essential to developing their engineering identities.

**Recommendations**

Schools should prioritize increasing access to engineering-focused courses, clubs, and extracurricular opportunities as a means of strengthening female students' interest in pursuing engineering careers. Creating such access is essential for shaping early exposure, building skills, and fostering a sense of belonging within STEM learning spaces.

High schools' guidance counselors can support young female students by having knowledge of engineering as a career path, providing engineering resources, and encouraging young women to explore STEM career paths. They can bring in STEM companies to career fairs, guide students through appropriate STEM coursework, and introduce female STEM role models to help students envision their futures in engineering. Cyr's study [8] shows that female students' belief that they will belong in future STEM environments significantly increases both interest in STEM careers and motivation to take advanced STEM coursework.

Together, these findings support the conclusion that engineering pathways must be intentionally accessible, visible, and socially supportive. When girls have opportunities to participate in engineering classes and clubs, they are more likely to envision themselves in engineering roles. Schools that expand and normalize access to engineering programming play a pivotal role in shaping these future trajectories.

**Limitations**

While the results of this study build off of existing literature and demonstrate a national story playing out locally in Connecticut, there are still limitations that contextualize this research. First, the sample size was small. A total of 63 students participated, representing the approximately 164,900 high school students in Connecticut. Additionally, the dataset lacked demographic variables, including age, race, ethnicity, and other identity markers that are known to shape STEM experiences. While this was a conscious decision by the research team due to the limited resources for interview compensation, it does mean that additional details regarding how other aspects of identify may interact with gender identity in the context of engineering identity development are not able to be expanded upon. Finally, the recruitment process may have introduced sampling bias. Students were recruited through teachers who were already highly engaged in STEM programming and were more likely to promote engineering-related opportunities in their classrooms. While this may have influenced some of the students who experienced demonstrated in our results, the representation by a large number of female students not planning to pursue an Engineering career or those who expressed they did not participate in engineering clubs or classes at school demonstrates the participants were still varied.

**Conclusion**

Our study found that access to engineering classes, clubs, support from guidance, and other engineering resources plays an important role in young women's interest in pursuing engineering pathways. Early and sustained exposure to engineering opportunities, along with affirming interactions from teachers and peers, is important for developing a sense of belonging in the field. The results also highlight the ongoing impact of historical gendered expectations and recognition barriers that can discourage girls even when engineering opportunities are present.

Together, this study identifies the need for school environments that not only provide equitable engineering opportunities but also actively cultivate inclusive cultures where all students can see themselves as future engineers.

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**References**

[1] M. Krzyzek, “STEM to Grow Faster than Overall Occupations Through 2030,” The Connecticut Economic Digest, Dec. 2022. Available: https://www1.ctdol.state.ct.us/lmi/digest/articles/December2022.pdf
[2] University of Connecticut, “University of Connecticut Degrees Conferred 2023-24 and 2024-25,” Office of Budget, Planning, and Institutional Research, Jul. 2025.
[3] A. D. Patrick, M. Borrego, and A. N. Prybutok, “Predicting Persistence in Engineering through an Engineering Identity Scale,” *International Journal of Engineering Education*, vol. 34, no. 2(A), pp. 351–363, Jan. 2018, Available: https://www.researchgate.net/

[4] L. Martin-Hansen, “Examining ways to meaningfully support students in STEM,” *International Journal of STEM Education*, vol. 5, no. 1, Dec. 2018, doi: https://doi.org/10.1186/s40594-018-0150-3.
[5] H. B. Carlone and A. Johnson, “Understanding the science experiences of successful women of color: Science identity as an analytic lens,” *Journal of Research in Science Teaching*, vol. 44, no. 8, pp. 1187–1218, 2007, doi: https://doi.org/10.1002/tea.20237.
[6] L. S. Nadelson and J. M. Callahan, “A Comparison of Two Engineering Outreach Programs for Adolescents,” *Journal of STEM Education: Innovations and Research*, vol. 12, no. 1, 2016, Available: https://www.jstem.org/jstem/index.php/JSTEM/article/view/1527
[7] T. Schmader and C. Sedikides, “State Authenticity as Fit to Environment: The Implications of Social Identity for Fit, Authenticity, and Self-Segregation,” *Personality and Social Psychology Review*, vol. 22, no. 3, pp. 228–259, Oct. 2018, doi: https://doi.org/10.1177/1088868317734080.https://doi.org/10.1177/1088868317734080.
[8] E. N. Cyr *et al.*, “Seeing women who fit: Girls’ forecasted fit in STEM fosters career interest,” *Social Psychology of Education*, vol. 28, no. 1, May 2025, doi: https://doi.org/10.1007/s11218-025-10056-2.https://doi.org/10.1007/s11218-025-10056-2.
[9] A. Ramírez-Salgado, Z. Xu, C. Wusylko, B. Abramowitz, and P. Antonenko, “Understanding engineering identity in K-12 education: A systematic literature review.,” *Nsf.gov*, Apr. 18, 2024. https://par.nsf.gov/biblio/10567812
[10] Z. Hazari, G. Sonnert, P. M. Sadler, and M.-C. Shanahan, “Connecting high school physics experiences, outcome expectations, physics identity, and physics career choice: A gender study,” *Journal of Research in Science Teaching*, vol. 47, no. 8, 2010, doi: https://doi.org/10.1002/tea.20363.
[11] A. Godwin, G. Potvin, Z. Hazari, and R. Lock, “Identity, Critical Agency, and Engineering: An Affective Model for Predicting Engineering as a Career Choice,” *Journal of Engineering Education*, vol. 105, no. 2, pp. 312–340, Apr. 2016, doi: https://doi.org/10.1002/jee.20118.
[12] E. J. Brunner, S. M. Dougherty, and S. L. Ross, “The Effects of Career and Technical Education: Evidence from the Connecticut Technical High School System,” *The Review of Economics and Statistics*, vol. 105, no. 4, pp. 1–46, Aug. 2021, doi: https://doi.org/10.1162/rest_a_01098.
[13] A. D. Patrick and M. Borrego, “A review of the literature relevant to engineering identity,” presented at the Annual Conference & Exposition, ASEE, Jun. 2016. Available: https://peer.asee.org/26382
[14] L. Sartain, S. Freire, J. Q. Easton, and B. Diaz, “When Girls Outperform Boys: The Gender Gap in High School Math Grades | EdWorkingPapers,” *Edworkingpapers.com*, Jan. 18, 2023. https://edworkingpapers.com/ai23-707 (accessed Apr. 27, 2026).
[15] G. Ellison and A. Swanson, “Dynamics of the Gender Gap in High Math Achievement,” *Journal of Human Resources*, vol. 58, no. 5, pp. 0620-10972R1, Jul. 2021, doi: https://doi.org/10.3368/jhr.58.5.0620-10972r1.https://doi.org/10.3368/jhr.58.5.0620-10972r1.
[16] The Nation's Report Card, “National Data Explorer - ETS,” *Nationsreportcard.gov*, 2026. https://www.nationsreportcard.gov/profiles/stateprofile
[17] P. Kauffmann, C. W. Hall, M. J. Bossé, and L. A. Moses, “Factors influencing high school students’ career considerations in STEM fields,” presented at the Annual Conference & Exposition, ASEE, Jun. 2009.
[18] A. Srivastava and S. B. Thomson, “Framework Analysis: A Qualitative Methodology for Applied Policy Research,” *JOAAG*, vol. 4, no. 2, Nov. 2008, Available: https://www.researchgate.net/publication/267678963_Framework_Analysis_A_Qualitative_Methodology_for_Applied_Policy_Research

[19] High-Schools.com, “Connecticut High Schools,” *https://high-schools.com/directory/ct/*, 2025. https://high-schools.com/directory/ct/
[20] CTData Collaborative, “Connecticut Town Profiles by CTData Collaborative,” *profiles.ctdata.org*, Mar. 17, 2026. https://profiles.ctdata.org/
[21] G. Sonnert, T. Reid, S. Sunbury, and P. M. Sadler, “How do formal and informal science learning experiences during high school shape students’ career interest and STEM identity?,” *International Journal of STEM Education*, vol. 12, no. 1, Oct. 2025, doi: https://doi.org/10.1186/s40594-025-00568-w.

**Appendix**

*Appendix 1: Full Codebook with descriptions*

| CODE | FULL CODE | DESCRIPTION |
|---|---|---|
| **A.B.1** | Engineering isn't accessible | Student expresses belief that not everyone who wants to be an engineer can be (does not need to be justified, may be justified through other codes) |
| **A.B.2** | Student didn't take Engineering classes/clubs offered | Students express that they didn't take or participate in their school's offered engineering classes / programs (classes, clubs, etc.) |
| **A.B.3** | Guidance doesn't have Engineering resources | Students feel their school / guidance counselors or offices don’t provide resources about engineering |
| **A.B.4** | Guidance doesn't support career discovery | Students feel their school / guidance counselors or offices don’t provide sufficient resources about career exploration or discovery |
| **A.B.5** | School doesn't offer Engineering classes/clubs | Student expresses that their school doesn’t offer engineering-related classes (classes, clubs, etc.) |
| **A.B.6** | Student doesn't have enough exposure or role models | Students don’t have enough exposure or role models to determine if they would like engineering as a career |
| **A.D.1** | Engineering is accessible | The student expresses the belief that anyone who wants to be an engineer can pursue engineering if they want to |
| **A.D.2** | Student takes Engineering classes | The student's school offers engineering classes / program and the student participates (classes, clubs, etc.) |
| **A.D.3** | Guidance does have Engineering resources | Students feel their school / guidance counselors or offices provide resources about engineering |
| **A.D.4** | Guidance does support career discovery | Students feel their school / guidance counselors or offices provide sufficient resources about career exploration or discovery |
| **A.D.5** | School offers Engineering classes/clubs | Student expresses that their school does offer engineering-related classes (classes, clubs, etc.) |
| **A.D.6** | Aware of different engineering fields | The student is aware that engineering has several different fields or branches |
| **C.B.1** | Bad at math or science | Students believe that they are bad at math or science and can't pursue engineering |
| **C.B.2** | Engineering is too difficult | The student believes the major / career is too difficult for them, or wants a major / career that seems easy to do |

| | | |
|---|---|---|
| **C.D.1** | Good at math or science | Students believe that they are good at math or science and can pursue engineering |
| **C.D.2** | Willing to learn | Students express a willingness to learn and overcome difficult coursework (difficult coursework will not prevent career aspirations) |
| **I.B.1** | Engineers must be naturally smart | Students believe that engineers are nerdy, highly intelligent, or academically talented (not something learned but based on innate abilities) |
| **I.B.2** | Engineering is math or science | The student believes engineering is math and science or closely related to math and science |
| **I.B.3** | Dislikes math or science | The student dislikes math or science and doesn't want to pursue engineering |
| **I.B.4** | Engineering rigor limits pursing other interest | The student believes that the course rigor of Engineering will limit the exploration of other interests |
| **I.B.5** | Engineering is construction or labor | The student believes engineering is construction work, trade work, or physical labor |
| **I.B.6** | Engineers work at a desk / computer | The student believes engineering is desk work, such as working on a computer all day |
| **I.D.1** | Engineering skills can be learned | The student believes engineering skills can be learned |
| **I.D.2** | Engineers solve problems creatively as a team | The student believes engineers are creative problem solvers who work collaboratively |
| **I.D.3** | Enjoys math or science | The student likes math or science |
| **I.D.4** | Engineers are focused/passionate | The student notices that engineers are passionate and determined to pursue engineering. Once you make up your mind to be an engineer, you will persevere and be an engineer |
| **I.D.5** | Engineering can help the world | The student believes that engineering is important to the world, or helps others |
| **I.D.6** | Engineers are hands-on | The student is aware of the hands-on parts of engineering, such as building things |
| **R.B.1** | Engineering in media | The student uses media (any form) to determine what engineering is or who engineers are |
| **R.B.2** | Student dislikes by being alone in male-dominated field | The student is intimidated or feels unsupported in male-dominated classes, or believes girls would feel that way |
| **R.B.3** | Doesn't know someone in Engineering | The student doesn't personally know any engineers |
| **R.B.4** | Women's societal expectations to pursue soft careers | Student recognizes the social expectation (current or historical) for women's career choices lean towards "soft careers" |
| **R.D.1** | Knows someone in Engineering | Student names someone close to them who is an engineer (Family member, friend, teacher) |
| **R.D.2** | Aware of more women in Eng | The student notices that there are more women pursuing engineering now |

*Appendix 2: Interview questions*

**Interview Questions – Interested in Engineering**

1. Can you share your understanding of what an engineering degree involves?
2. How did you first develop an interest in engineering, if at all?
3. Were there any moments that made you hesitant about pursuing engineering?
4. Do you think engineering is a field that is accessible to young women / students? Why or why not?
5. Do you feel that you have adequate support at school (guidance counselors, teachers, family) to help you navigate a potential career in engineering?
6. Are there specific skills that you feel are necessary for engineering?
7. Do you think those skills are a barrier for some students?
8. Do you feel there are stereotypes about what kind of person can be an engineer? Have these stereotypes affected your decision to pursue engineering?
9. Do you think there's enough encouragement and community for young women or young men to pursue STEM careers?
10. What initiatives or programs would help increase the number of students pursuing engineering degrees?
11. Do you think we should be aware of any overlooked challenges in wanting to pursue an engineering degree?
12. Is there anything else you'd like to share about how students make career decisions and what influences them?

**Interview Questions – Not Interested in Engineering**

1. What comes to mind when you think about engineering as a career?
2. Have you ever considered engineering as a possible career path? Why or why not?
3. What factors have influenced your decision not to pursue engineering?
4. Do you feel that your school provides enough information about what an engineering career would be like?
5. Are there specific skills that you feel are necessary for engineering?
6. Do you think those skills are a barrier for some students?
7. Have you ever felt that specific career paths, including engineering, were more challenging for young women / some young students to access?
8. Do you think there are stereotypes about the type of person who becomes an engineer?
9. Do you feel some careers are more encouraged for young women or young men than others? If so, what are they, and why do you think that is?
10. What could make engineering feel more accessible for students like you?
11. Are there aspects of engineering that might be interesting if presented differently?
12. Are there any challenges to choosing a career path that you think are often overlooked?
13. Is there anything else you'd like to share about how students make career decisions and what influences them?