



# Addressing the Gender Gap in College Engineering

By Tara Bagheri



## Research Question: How can the disproportionate drop out rate of women in undergraduate engineering majors in college be addressed and reduced?

Problem Statement: Aspiring women engineers face a variety of challenges in college due to enduring stereotypical biases that hinder their retention in engineering majors compared to their male counterparts.

### Abstract

In a society that views the engineering field as masculine, women in college engineering face an uphill battle to stay in these majors. To uncover the root cause of this disproportionate drop out rate, I conducted three main phases of research: academic literature review, expert interviews, and student surveys. Culminating these findings I concluded the root cause of female drop-outs and proposed a solution to improve retention rates. Research has been conducted on the reasons why women leave Engineering majors, however there is a gap of connecting these findings to implementing effective solutions.

### Background

In college, women Engineering majors face various discriminatory challenges, leading them to drop out at a significantly higher rate than their male counterparts. As a result, only ~14% of the Engineering fields in the United States in 2016 were comprised of women (Salas-Morera et al., 2021). This misrepresentation continues to have a negative impact on society as the lack of diversity causes Engineering fields to miss out on valuable contributions that can benefit all people (Schäfer, 2006). Women face challenges in STEM careers because of discourses that represent females and males as opposite (Saavedra et al., 2014). Tackling the gender gap in Engineering will make the Engineering field more accessible to women, and make this field have more contributing ideas and perspectives, which benefits everyone regardless of gender.

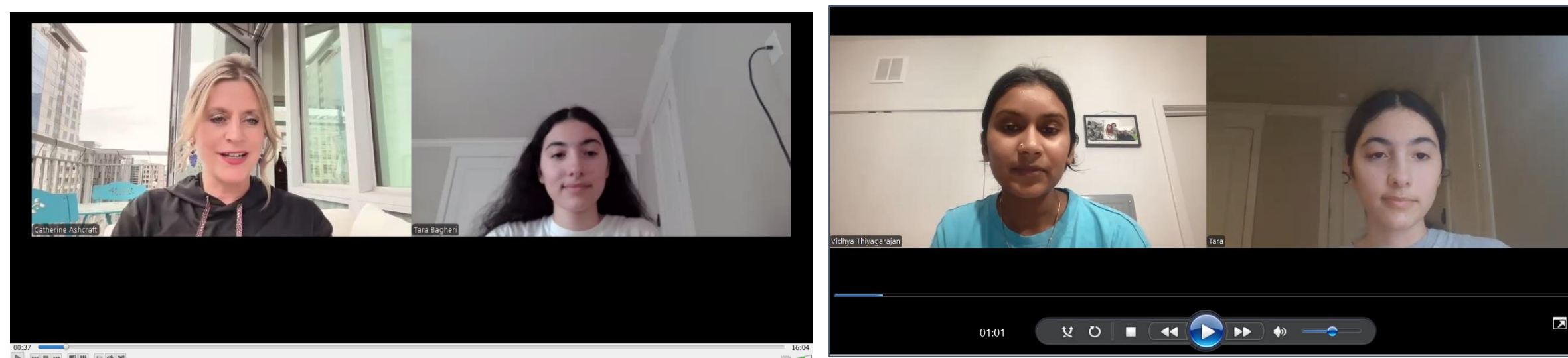
### Citations

- Saavedra, L., Araújo, A. M., Taveira, M. do C., & Vieira, C. C. (2014). Dilemmas of girls and women in engineering: a study in Portugal. *Educational Review*, 66(3), 330–344. <https://doi.org/10.1080/00131911.2013.780006>
- Salas-Morera, L., Ruiz-Bustos, R., Cejas-Molina, M. A., Olivares-Olmedilla, J. L., García-Hernández, L., & Palomo-Romero, J. M. (2021). Understanding why women don't choose engineering degrees. *International Journal of Technology & Design Education*, 31(2), 325–338. <https://doi.org/10.1007/s10798-019-09550-4>
- Schäfer, A. (2006). A new approach to increasing diversity in engineering at the example of women in engineering. *European Journal of Engineering Education*, 31(6), 661–671. <https://doi.org/10.1080/03043790600911738>

### Results

#### Main Takeaways from my Interviews:

- Belonging and connectivity are critical factors to retention
- Organizations, like the Society of Women in Engineering, help women feel supported
- In-class friendships, while important, are not as influential as other factors for retention, such as community
- Reforming the culture around engineering is a multifaceted problem



### Method and Process Steps and Materials

- Convergent Mixed Methods: collecting qualitative and quantitative research simultaneously
- Key phases: literature review, expert interviews, and survey data
- I conducted a literature review of over 15 academic sources that was synthesized into a two charts.
- I conducted interviews with three experts: Mrs. Desiree Turner (Associate Director of WIE at GA Tech), Ms. Vidhya Thiyagarajan (Collegiate Director on National SWE Board), and Dr. Catherine Ashcraft (NCWIT researcher).
- I formatted my survey on Microsoft Forms and updated it based on feedback from Georgia Tech students.
- I distributed the survey to undergraduate students at Georgia Tech through Dr. Garmestani and personal contacts.
- I formatted the survey data in Excel and created three data visuals.
- By synthesizing this information, I created a solution proposal for a solution that addresses the root cause of disproportionate female retention in engineering.

### Hypothesis

The more in-class friendships a female Engineering student has, the higher their feelings of belonging in the Engineering field.

Independent Variable: In-class friendships

Dependent Variable: Feeling of belonging

Belonging within the Engineering college culture plays the largest role in causing female students to exit Engineering.

Independent Variable: Critical factors

Dependent Variable: Retention level

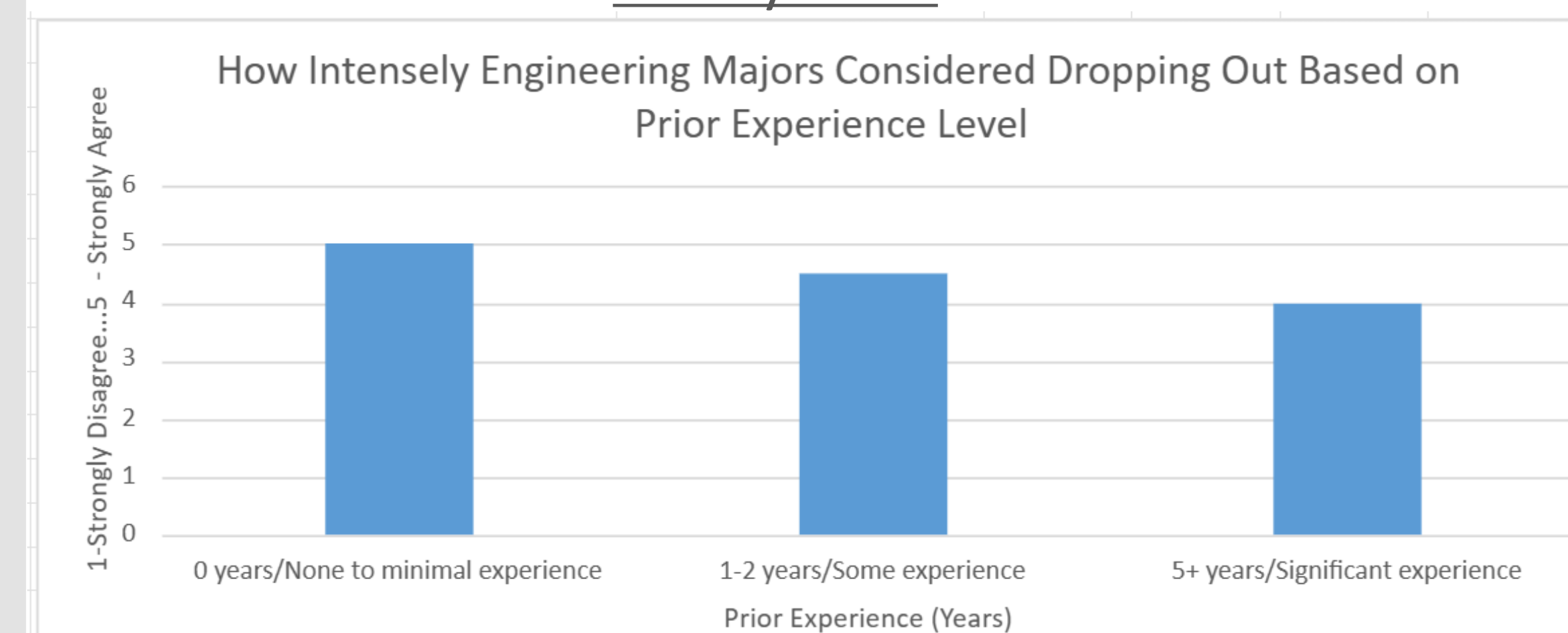
### Results

#### Charts Synthesizing Literature Review:

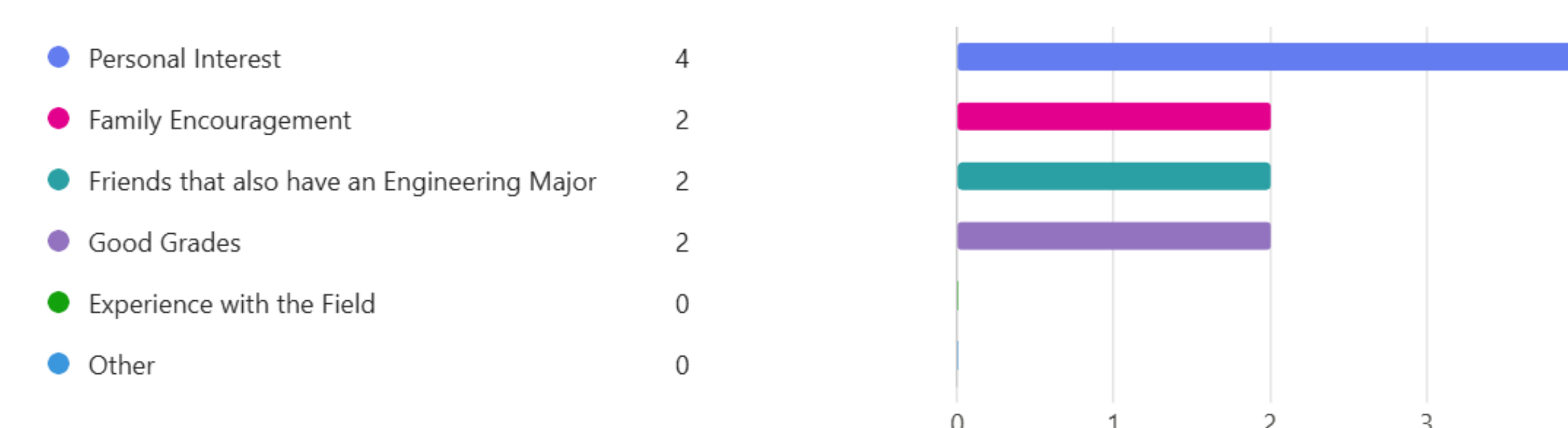
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|----|--|
| 1  | Proven Reasons   |
| 2  | Lack of Belonging  |
| 3  | Lack of Confidence   |
| 4  | Societal Views   |
| 5  | Masculine Culture  |
| 6  | Harassment   |
| 7  | Discouragement from an Early Age                                   |
| 8  | Exposure to Gender Stereotypes in the Workplace (at Internships)   |
| 9  | Personal View that Engineering is a Male Field                     |
| 10 | Views that Females are "the negation of the masculine"/Subordinate |

|    |  |
|----|--|
| 1  | Possible Solutions   |
| 2  | Peer Mentorship Programs                                   |
| 3  | Expert Mentorship Programs                                 |
| 4  | Diversity Lectures   |
| 5  | High School Outreach Programs                              |
| 6  | Middle School Outreach Programs                            |
| 7  | Elementary School Outreach Programs                        |
| 8  | Women-Based Organizations/Clubs                            |
| 9  | Update Curriculum to Acknowledge Humanitarian Applications |
| 10 | Shift Societal View of Masculine Culture                   |

#### Survey Data:



11. Which factors led you to choosing an Engineering major?



### Conclusion

- Women drop out of undergraduate Engineering majors at a higher rate than men because of a lack of belonging that is caused by a dominantly male field. (Sub-Question #1)
- Existing solutions to increase women's retention rates are organizations and clubs, peer mentorship, and high school outreach. These solutions have fallen short because they are not widespread enough and can tend to miss addressing the root issues. (Sub-Question #2)
- Close friendships do not affect retention rates of Engineering students as much as other factors. However, connectivity and belonging are the two major determinants for retention. (Sub-Question #3)
- The most influential factor in retention rates is a sense of belonging, since this directly connects to other major factors like self-efficacy and emotional wellbeing. (Sub-Question #4)
- Solutions must address the lack of belonging by improving connectivity and relationships.
- A feasible, novel solution would be to combine women's organizations, high school outreach programs, and peer mentorship programs to create an innovative mentorship program that supports women from high school.

### Next Steps

The next step for my project is implementation of my solution. For this, I will get feedback and refine the plans. In the future, I hope to test this solution by conducting a pilot program, in which a group of students will go through the program and evaluate their experience using a factorial survey.

### Acknowledgements

Mrs. Desiree Turner, *Interviewee*  
Ms. Vidhya Thiyagarajan, *Interviewee*  
Dr. Catherine Ashcraft, *Interviewee*  
Dr. Garmestani, *Distributed Survey*