

How Can We Increase Female Engineering Retention Rates at Union?

By: Alexis Nikitas

I'm Alexis Nikitas majoring in mechanical engineering from Windham, New Hampshire. I'm a sophomore in the Scholars Program here at Union. This project was inspired by my first-hand experience being a female engineering student. I want to bring awareness about the struggles of being a female engineer and be a part of an important change.

Self-Efficacy and Confidence Levels

Definition of Self Efficacy: An individual's belief in his or her capacity to execute behaviors. Plays a critical role in an individual's motivation and performance attainments
-Women, especially in STEM fields are proven to have lower self-efficacy levels than their male counterparts [3].

In many cases, women avoid or leave engineering related courses because they suffer from loss of perceived academic competence or underestimate their capability rather than because they lack competence or skill [3].

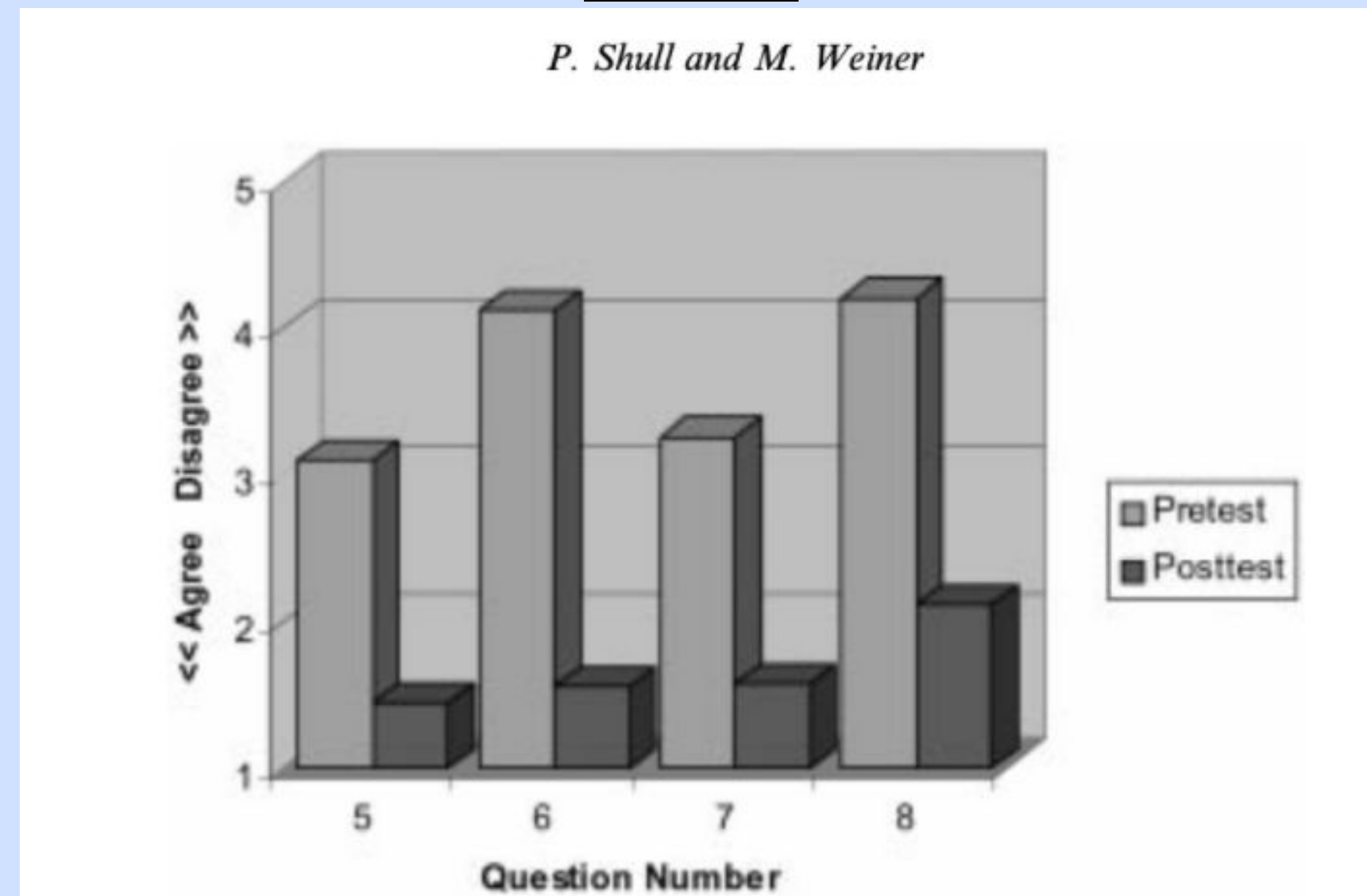
Focus of Self-Efficacy Study:

A computer repair and diagnostics course designed specifically for women in engineering [3].

The course was created with these aspects in mind:

- Information technology
- Task specific
- Relevant experience and training
- Laboratory experience
- Modeling
- Environmental factors
- Supportive environment
- Interaction with peers

Results:



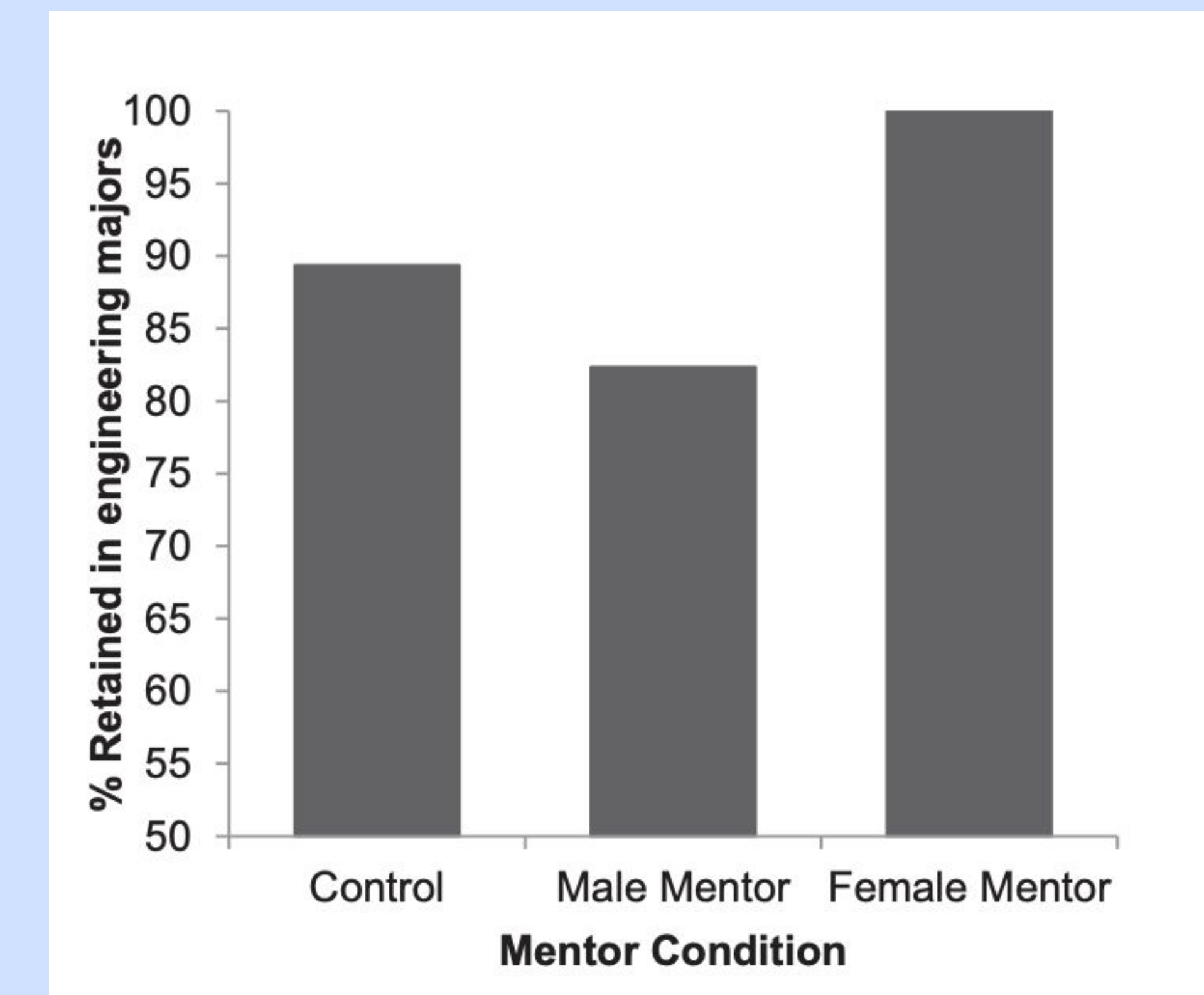
Responses to questions on students' perceived effects of training on self-efficacy beliefs

Shull, P.J. & Weiner, M.. (2002). Thinking inside the box: Self-efficacy of women in engineering. *International Journal of Engineering Education*. 18. 438-446.

Project Advised by: Professor Cortez

Peer Mentoring

- Female mentors help to give a sense of belonging to the mentee and help them to connect with their peers [2].
- Extremely important to happen early on when the mentees are most vulnerable to self-doubt. This greater sense of belonging protects women's aspirations to pursue careers in engineering after college [2].



Dennehy, T. C., & Dasgupta, N. (2017). Female peer mentors early in college increase women's positive academic experiences and retention in engineering. *Proceedings of the National Academy of Sciences*, 114(23), 5964-5969. doi:10.1073/pnas.1613117114

What Could be Implemented at Union?

- Female engineering mentorship program between upperclassmen and first-years
- A course/model designed for female engineering students to improve confidence levels
- Existing programs at Union should be designed to enhance career and academic efficacy beliefs
- More female representation in engineering staff and faculty members (specifically in ESC 100)
- Increase promotion of female STEM groups such as SWE (have it mentioned in first year classes, ESC-100 and MER seminars)

References:

[1] incon, R. (2019, November 01). SWE Research Update: Women in Engineering by the Numbers. From <https://alltogether.swe.org/2019/11/swe-research-update-women-in-engineering-by-the-numbers-nov-2019/>

[2]Dennehy, T. C., & Dasgupta, N. (2017). Female peer mentors early in college increase women's positive academic experiences and retention in engineering. *Proceedings of the National Academy of Sciences*, 114(23), 5964-5969. doi:10.1073/pnas.1613117114

[3] Shull, P.J. & Weiner, M.. (2002). Thinking inside the box: Self-efficacy of women in engineering. *International Journal of Engineering Education*. 18. 438-446.

[4] Franchetti, M. (2012). An Analysis of Retention Programs for Female Students in Engineering at the University of Toledo. *Journal of Pre-College Engineering Education Research (J-PEER)*, 2(1), Article 3. <https://doi.org/10.5703/1288284314652>

Goal: To figure out which methods are effective in increasing female engineering student retention rates and what can be implemented at Union College.

Current Statistics:

- Over 32% of women switch out of STEM degree programs in college [1].
- Females were awarded only 19.9% of engineering bachelor degrees in 2015 and 21.9% in 2019. Females make up 21.4 percent of undergraduates enrolled in engineering [1].
- Only 30% of women who earn bachelor's degrees in engineering are still working in engineering 20 years later [1].

WISE program at the University of Toledo [4]:

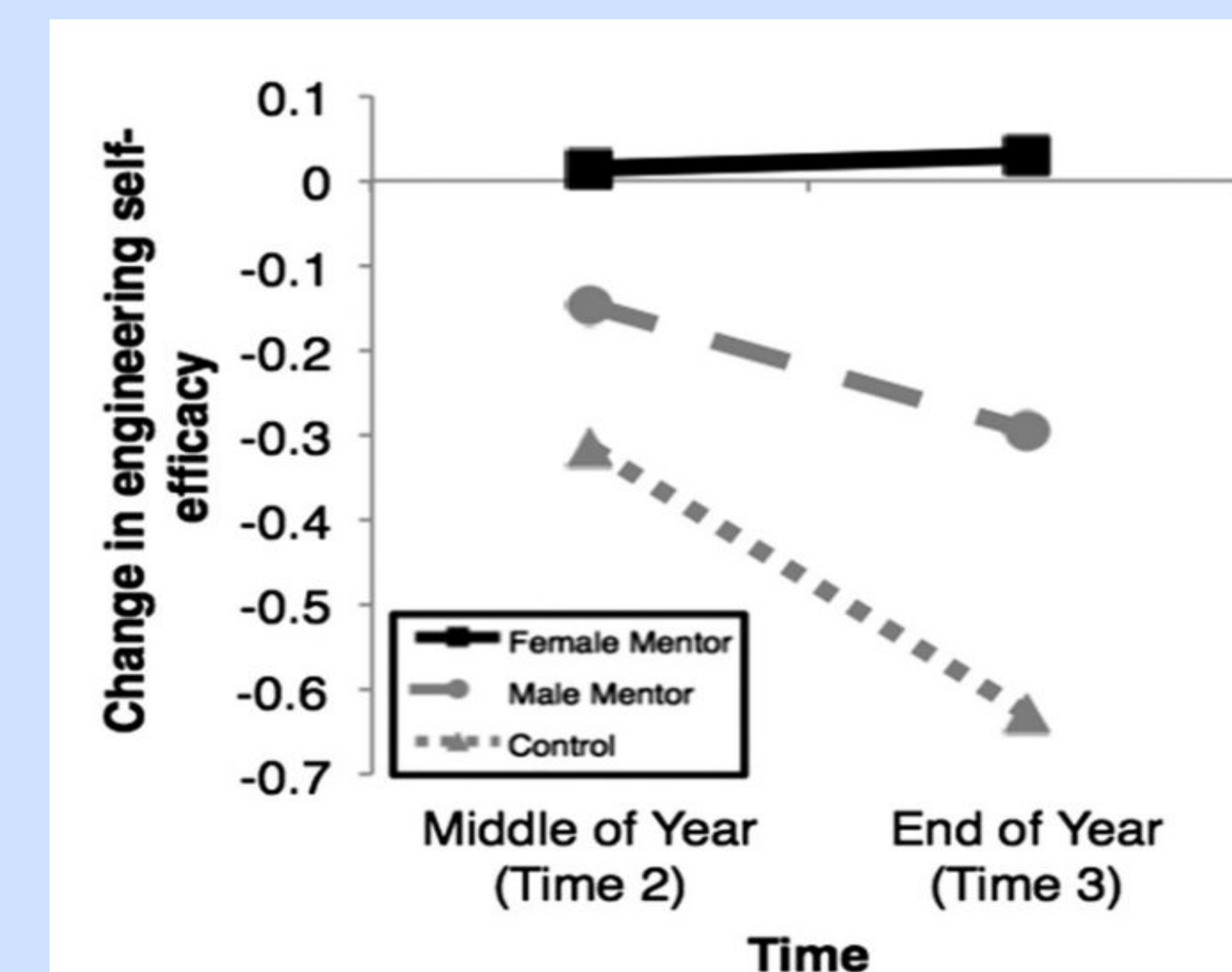
The program links women science students with mentors, academic support, and a peer community during their first year of study

Programs:

- Co-op Program Support Group and Peer Mentoring for Females
- Society of Women Engineers (SWE) cohort
 - 63% of the female engineering student population are members.
- Hiring of Female Faculty and Staff
 - Demonstrates that females can be very successful in engineering and science.

Results:

From 2003-2007 the retention rate from the freshman to the sophomore year for female engineering students increased from 52% to 73%



Effect of mentor condition on women's self-efficacy in engineering

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