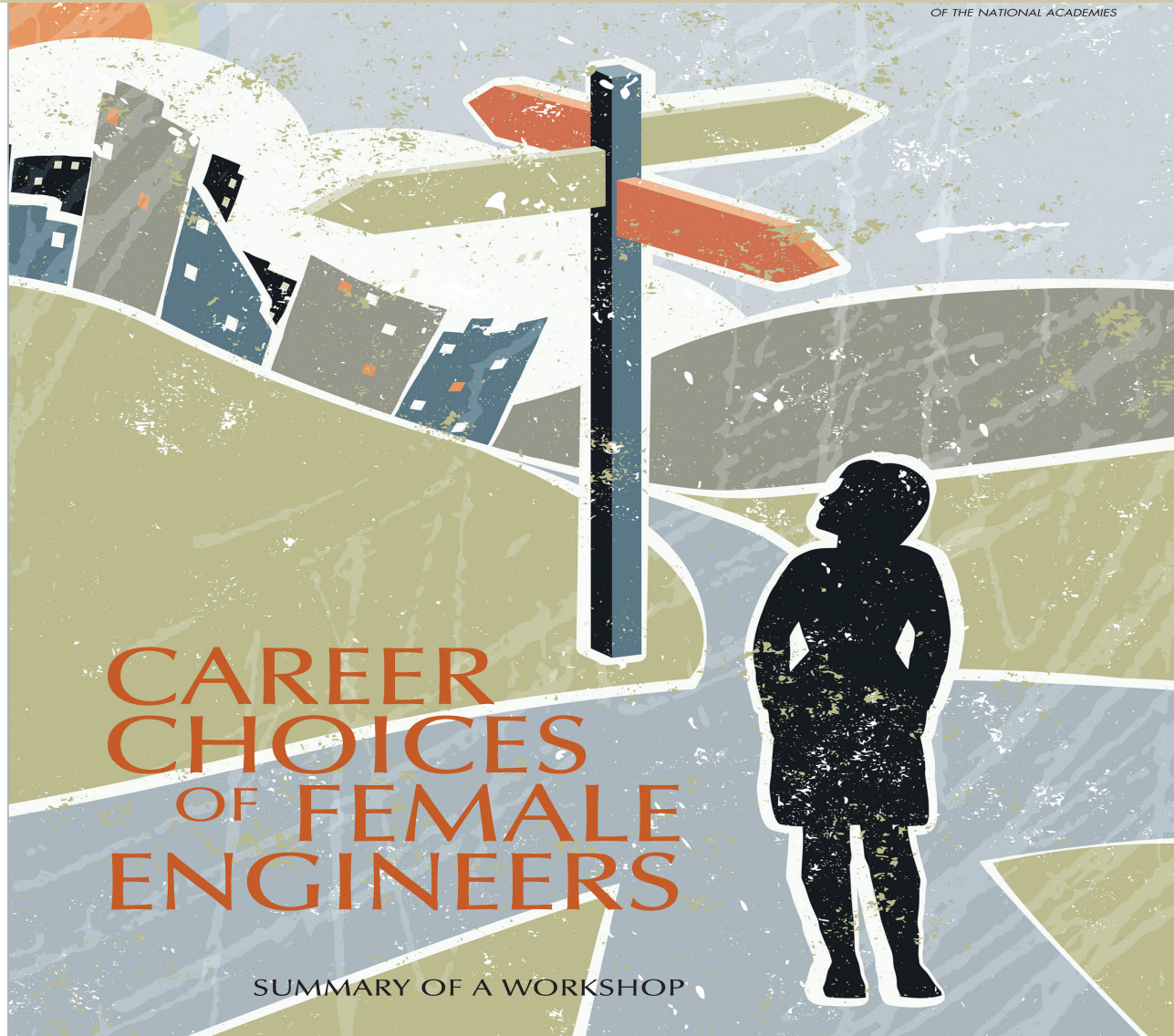


ASEE 2015 Distinguished Lecture: National Academies Report on Career Choices of Women Engineers



Alice M. Agogino, University of California at Berkeley



BACKGROUND

As part of a project to examine the career outcomes of female recipients of bachelor's degree in engineering, the National Research Council Committee on Women in Science, Engineering, and Medicine (CWSEM) held a workshop on April 24, 2013, titled "Career Outcomes of Female Engineering Bachelor's Degree Recipients". The project was supported by the National Science Foundation (Grant No. 1137641).

The workshop was designed to increase (1) understanding of gender differences in the recruitment, retention, and advancement of women at critical transition points and (2) investigate and share the best practices to facilitate career transitions and advancements for all.

A summary of the workshop was published in 2014. This overview highlights some presentations and data from the workshop summary.

The views expressed are those of individual conference participants and do not necessarily represent the views of all conference participants, the planning committee, the National Research Council, or the National Science Foundation.



INTRODUCTION

- Despite decades of government, university, and employer efforts to close the gender gap in engineering, **women make up only 11 percent of practicing engineers in the United States.**
- Efforts at this workshop to examine women's career paths and obstacles can point the way to ensuring that our world has a system in which women and minority groups can fully participate.
- The loss of women engineers from technical workplaces has implications for women themselves, the organizations they leave, and society as a whole.
- It is critical to US technological competitiveness and national security to understand factors that will help engineering organizations retain their highly trained workforce and avoid preventable turnover.

CAREER OUTCOMES OF WOMEN ENGINEERING BACHELOR'S DEGREE RECIPIENTS

GAIL GREENFIELD

Greenfield examined two key career outcomes: (1) the percentage of graduates in the labor force (**“labor force participation”**) and (2) the percentage of employed graduates working in the field of their major (**“retention”**)

Overall, Greenfield found:

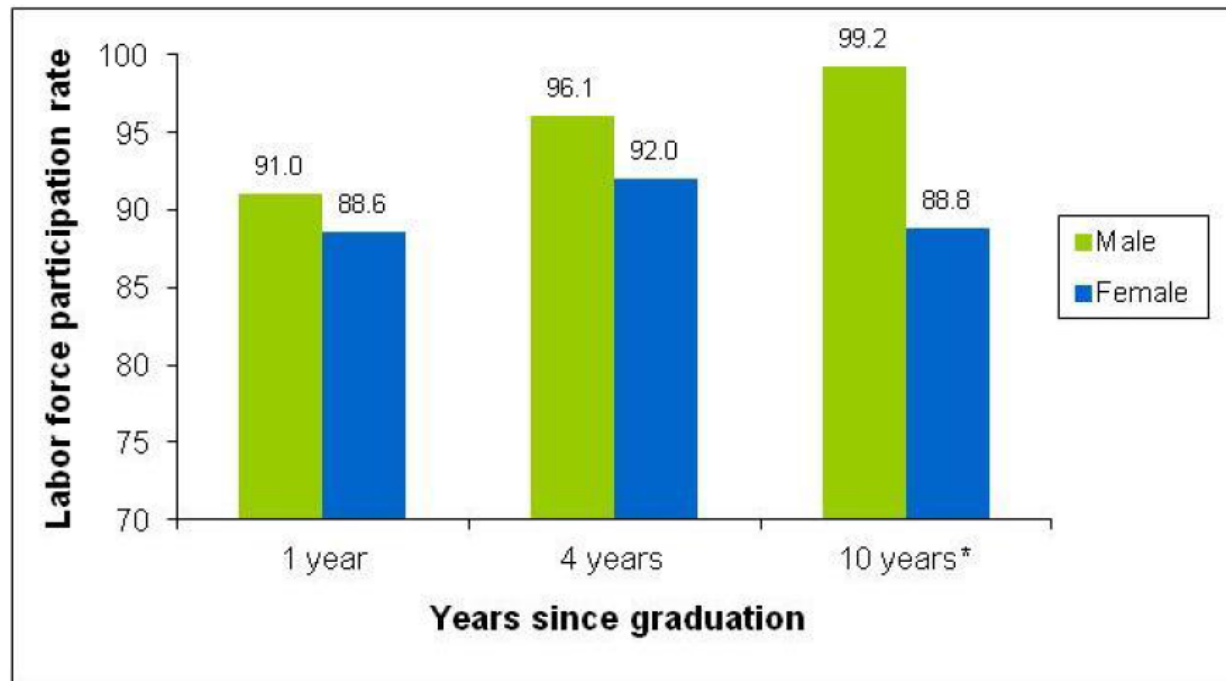
“participation in the labor force is not a concern: women are participating in the labor force at high rates. It is retention in engineering that appears to be a challenge for both men and women: ten years after graduation.”

CASES FOR EACH COHORT AND SURVEY

Cohort	Survey Year	All	Male	Female
1	1994	640	550	90
1	1997	625	535	90
1	2003	575	490	85
1	All	520	440	80
2	2001	580	480	100
3	2009	930	750	180

Greenfield, G. (2014). The Career Outcomes of Female Engineering Bachelor's Degree Recipients: a study using the Baccalaureate & Beyond (B&B) Longitudinal Study. Taken from *Career Choices of Female Engineers: A Summary of a Workshop*. The National Academies Press, 2014.

LABOR FORCE PARTICIPATION RATE BY GENDER FOR ENGINEERING BACHELOR'S DEGREE RECIPIENTS IN THE 1992-1993 ACADEMIC YEAR



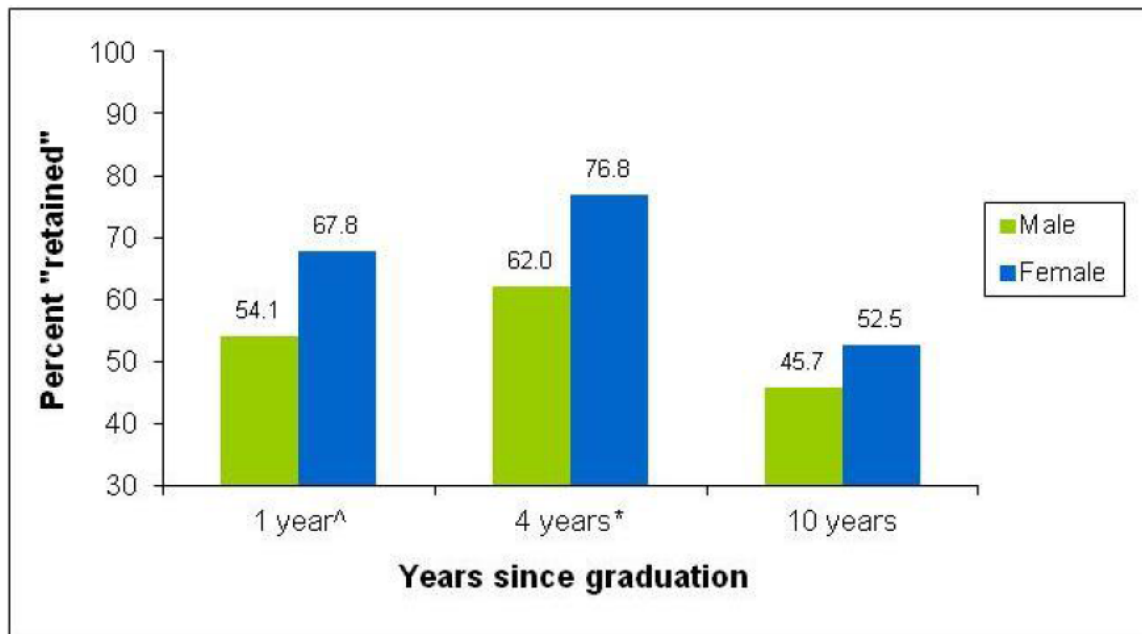
Key findings

- Male participation increases with time, female participation does not.
- While female participation 10 years after graduation remains high, it is still 10% lower than males.

*Difference between men's and women's rates is statistically significant at the 5 percent level.

Source: National Center for Education Statistics.

EMPLOYED ENGINEERING BACHELOR'S DEGREE RECIPIENTS FROM THE 1992-1993 ACADEMIC YEAR IN AN ENGINEERING/ARCHITECTURE OCCUPATION



^Difference between numbers for women and men is statistically significant at the 10 percent level. *Difference between numbers for women and men is statistically significant at the 5 percent level. The decline in the percent retained from four to ten years after graduation is statistically significant at the 5 percent level for both men and women.

Source: National Center for Education Statistics.

Key findings

- The retention rate for both men and women drops ten years after graduation.
- The retention rate at each year for engineering bachelor's degree recipients is higher for females than male.

STEMMING THE TIDE: WHY WOMEN ENGINEERS STAY IN, OR LEAVE, THE ENGINEERING PROFESSION

NADYA FOUAD AND ROMILA SINGH, UNIVERSITY OF WISCONSIN

Comparison of the women who leave with those who stay in engineering revealed four trends:

- No difference in self-confidence in performing tasks, navigating work politics, or managing non-work roles
- No difference in terms of interests
- Differences in experiences with supportive workplace environment
- Differences in level of commitment and satisfaction with the engineering profession. Women who are still in engineering report higher level of satisfaction.



STEMMING THE TIDE: WHY WOMEN ENGINEERS STAY IN, OR LEAVE, THE ENGINEERING PROFESSION

NADYA FOUAD AND ROMILA SINGH, UNIVERSITY OF WISCONSIN

Workplace climate is the biggest differentiator that sets apart women who are currently working in engineering from those who left the technical field.

Women currently working in the engineering field:

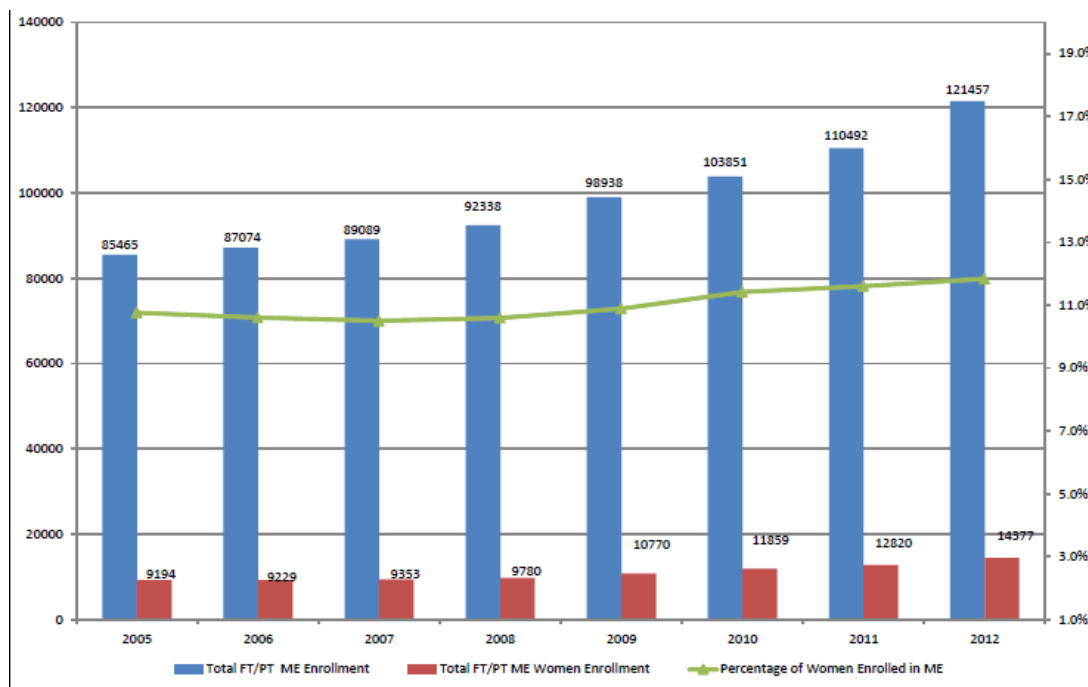
- Experienced a supportive workplace

Supportive workplace: family friendly work culture characterized by recognition of the importance of work-life balance and availability of work-life benefits

- Worked with empathic and understanding supervisors and coworkers
- Experienced fewer barriers at work in the form of incivility and undermining behaviors compared to women who left the technical field

RETAINING TECHNICAL TALENT: A DISCUSSION ON DATA NEEDS, CRITICAL TRANSITIONS, AND CAREER PATHWAYS

Total full-time/part-time enrollment in US undergraduate mechanical engineering programs, 2005-2012



Source: ASEE Data Mining Site, www.asee.org

The figure shows that despite seven years of continual enrollment growth in mechanical engineering, the enrollment of women remained stuck at 11-12 percent.

Can we dig deeper into the data?

RETAINING TECHNICAL TALENT: A DISCUSSION ON DATA NEEDS, CRITICAL TRANSITIONS, AND CAREER PATHWAYS

	2005	2012	Change in number	Percent increase
Female ME undergraduate education	9,194	14,377	5,183	56.40%
Male ME undergraduate education	76,271	107,080	30,809	40.40%

	2007	2012	Change in number	Percent increase
Female ME undergraduate education	9,353	14,377	5,183	53.70%
Male ME undergraduate education	79,736	107,080	27,344	34.30%

Source: ASEE Data Mining Site, www.asee.org

Upon closer examination, the data from the previous figure reveals that since 2005 the number of undergraduate women studying mechanical engineering has risen more than 10 percent faster than the number of men—an increase in women of over 55 percent, compared to a 40 percent increase in men.

TECHNICAL WOMEN IN SMALL AND MEDIUM BUSINESSES

EMILY BLAKEMORE, ANGIE IM, CHANNING MARTIN, ALBERY MELO, SARA RAJU, AND LIZ SCHUELKE.

THE H. JOHN HEINZ III COLLEGE, CARNEGIE MELLON UNIVERSITY

Women control 80 percent of consumer decisions but design only 10 percent of IT products and services.



Source: Harris, K., and M. Raskino. 2007. *Women and Men in IT: Breaking Sexual Stereotypes*. Stamford, CT: Gartner.



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Barriers to recruitment of women in IT:

- Subtle job posting bias deter women from seeking technical positions.
- Stereotypical environments (e.g. Star Trek posters, video games, etc.) marginally reduce women's identification with the computer science field.

Barriers to retention of women in IT:

- The IT field lacks a culture of collaboration and hands-on learning, causing women to feel isolated in their working environments.
- The stereotypical perception of women as less technologically capable than men perpetuates the underrepresentation of women in the IT field.



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Small businesses have more flexibility to propose and implement interventions rapidly.

Opportunities for small businesses:

- Adapt organizational environment to accommodate diverse populations, including women
- Encourage recruitment and implement mentoring programs for women in IT
- Provide access to professional technical societies that can be alternatives to internal mentoring program



RETAINING TECHNICAL TALENT: A DISCUSSION ON DATA NEEDS, CRITICAL TRANSITIONS, AND CAREER PATHWAYS

How to leverage the right resources to get the data we need

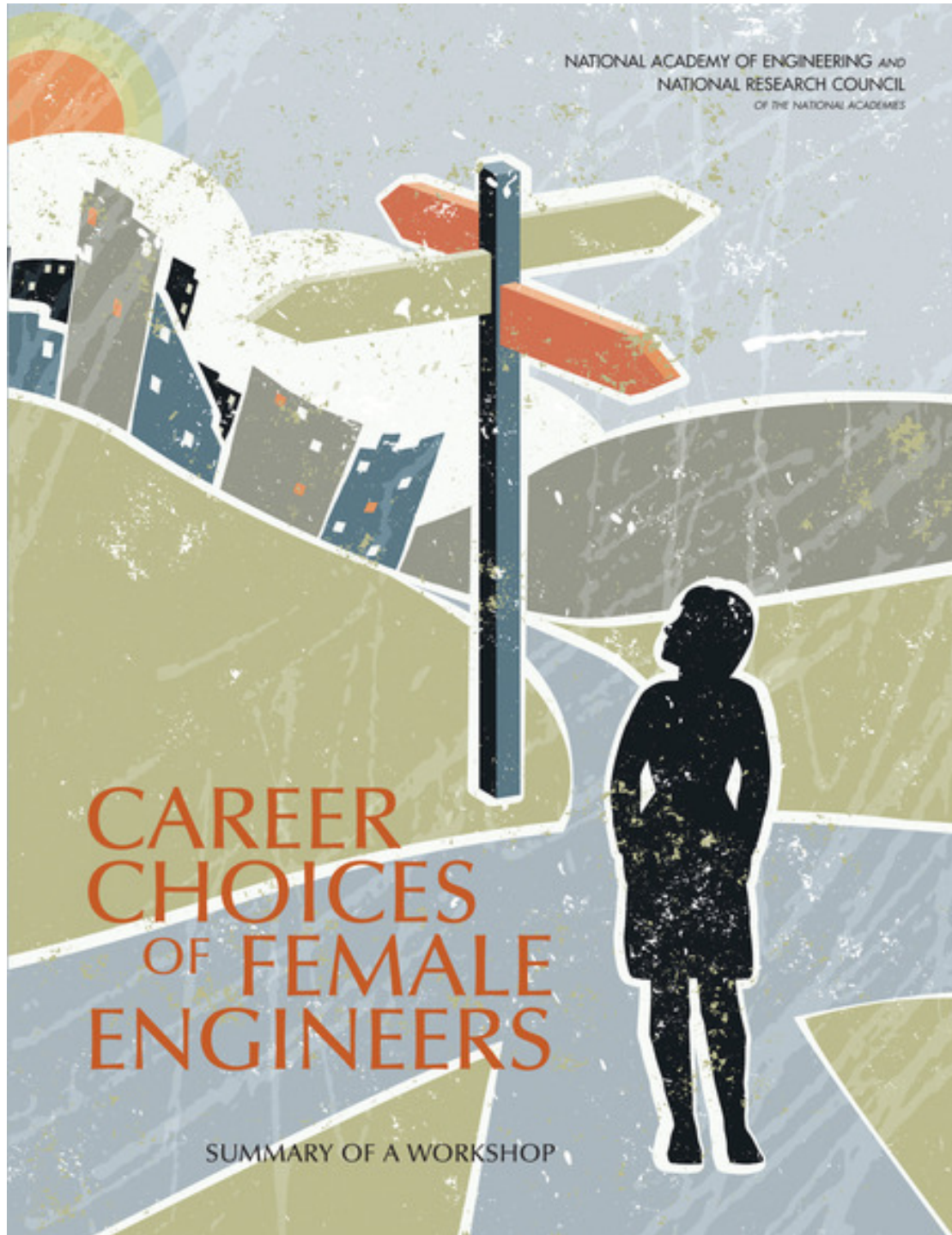
- Promote collaboration among engineering societies
- Make data publicly accessible while protecting confidentiality
- Engaging a diverse range of societies to ensure the inclusion of populations that aren't well represented in national datasets
- Benchmark datasets and conduct comparisons with other cultures , disciplines, and professions
- Encourage researchers to take a broader, interdisciplinary perspective in conducting their research



CLOSING DISCUSSION

What is needed to create environments where *all* people feel comfortable, rather than just one group?

- An understanding that diversity brings value to every field
- A change in paradigm, from gender neutrality, which often means the environment favors men, to a paradigm of inclusion
- Action taken by management to define success by taking gender into consideration



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PROJECT STAFF

Catherine Didion, Study Director

Nina Boston, Senior Program Assistant

Cameron Fletcher, Editor

Sara Frueh, Communications Writer

Wei Jing, Research Associate

Other Resources

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Thank You!