

# Exploring Gender and Self-Confidence in Engineering Students

## A Multi-Method Approach

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# Academic Pathways Study

Center for the Advancement of Engineering Education

- ▶ Large-scale study of undergraduate engineering students
- ▶ 3 cohorts of engineering student participants
- ▶ 1 cohort of early career engineers
- ▶ Research on the engineering learning experience *from the student perspective*
- ▶ Multiple methods, including surveys and interviews

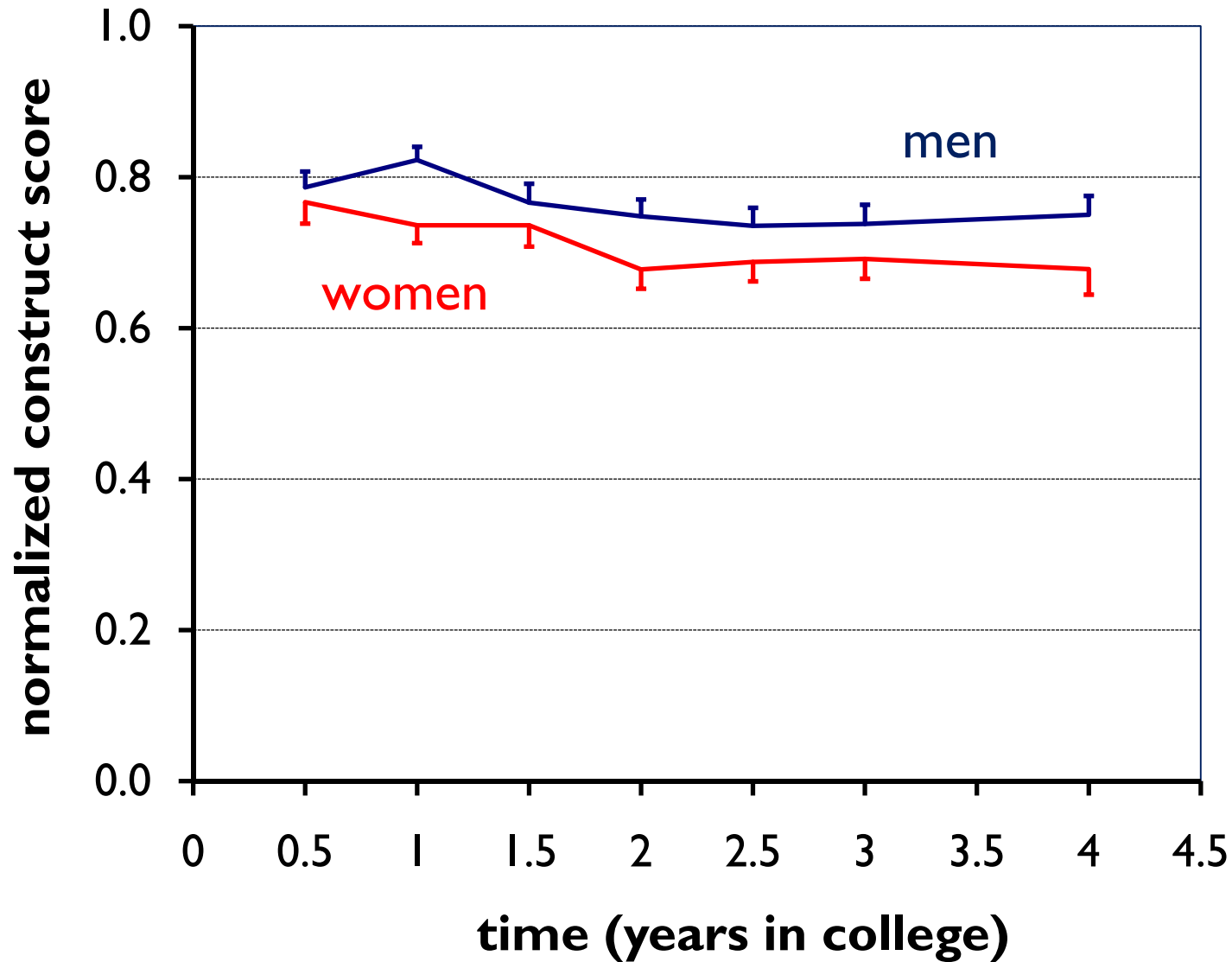
# Longitudinal survey data

- ▶ survey administered over four years
- ▶ powerful study design (gender, time)
- ▶ committed, successful students
- ▶ 45 females, 62 males

# Self-confidence: math and science

- ▶ How would you describe your...
  - math ability?
  - science ability?
  - ability to apply math and science to solve real-world problems?
- ▶ Likert-scale responses
- ▶ Repeated measures ANOVA (gender, time)

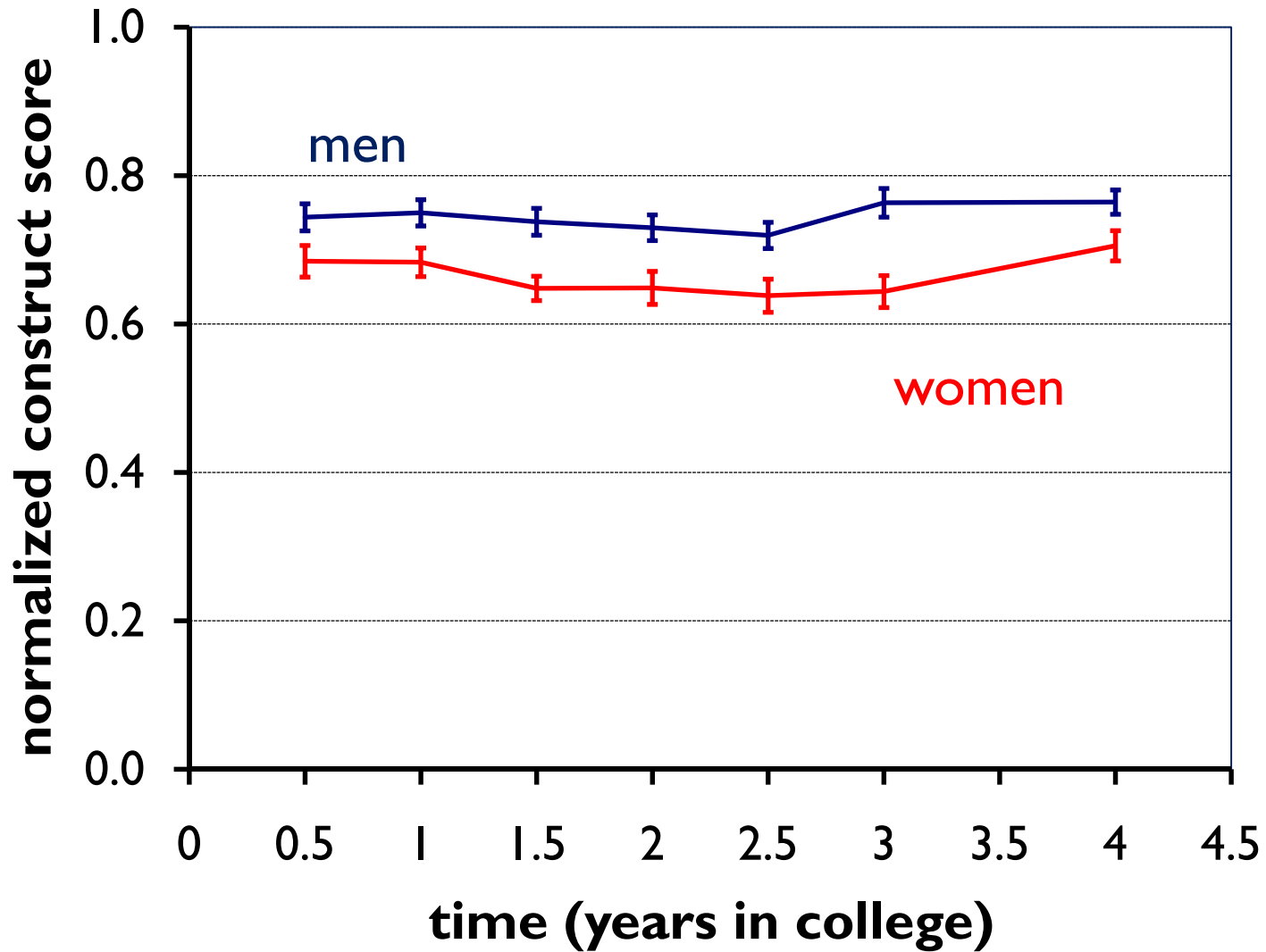
# Self-confidence: math and science



# Self-confidence: open-ended problem solving

- ▶ Creative thinking is one of my strengths.
- ▶ I am skilled at solving problems that can have multiple solutions.
- ▶ How would you describe your critical thinking skills?
- ▶ Likert-scale responses
- ▶ Repeated measures ANOVA (gender, time)

# Self-confidence: open-ended problem solving



# Qualitative Analysis



# The gendered experience

- ▶ **Sheer numbers are intimidating:** “As the minority, maybe women feel a little bit more intimidated or maybe, you know, have something to prove in a more male-dominated field”
- ▶ **Women worry more about how they appear:** “Usually guys are like, ‘I don’t care, I’ll just ask a question, and even if that is like, you know, a really bad question, if — even if people think it’s a stupid question, they don’t care, you know, they just ask the question.... if I think too much, I cannot ask the question, but if I stop thinking and say that I don’t care, I can be like a guy, too.’”

# The gendered experience

- ▶ **Women ought to be self-confident:** “I think any girl is just as capable as any guy doing engineering, but I've never seen one try. Even the girls that were in my department, they just seemed like they didn't think they should be there... With more scholarships available, extra help, student societies, things like that, girls' continued lack of confidence is basically their fault.”
- ▶ **There really is bias:** “It's kind of something that you just get the idea that this is the case without thinking about it. And then it kind of creeps into your conscious thought about things, and you're like wait a minute, that's crazy. And you have to actively say, no, that's not right. Girls are as good as guys at engineering.”

# Presentation of self as an engineer

- ▶ “I'm a hard worker. And a fast learner.”
- ▶ “I think I've had a pretty wide experience, wide range of experience already...”
- ▶ “I would want you to know what I'm interested in doing.”

# Why the differences?

- ▶ Actual differences in ability? (no evidence for this)
- ▶ Gender schemas: engineering as a male domain
- ▶ Identity threat among female engineering students
- ▶ Perception of 'special privileges' for female students
- ▶ Social norms of communication

# What can we do?

- ▶ Keep working to change the culture
- ▶ Create educational experiences that are not contingent on level of self-confidence
- ▶ Other ideas?

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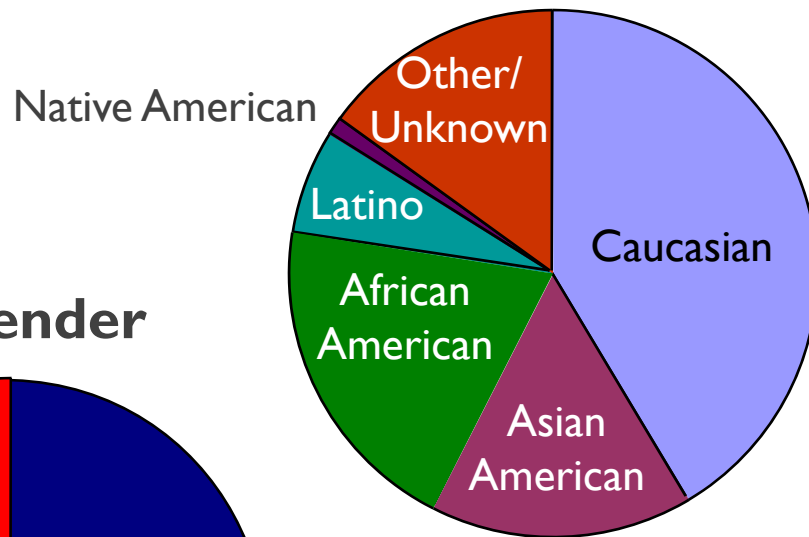
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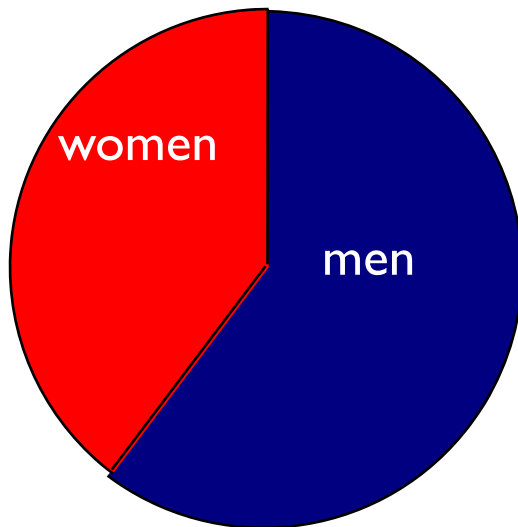
# APS longitudinal cohort

40 undergraduates × 4 institutions

by race/ethnicity



by gender



by citizenship

