

# **Some Here, More There: What Attracts Women to Engineering Majors?**

**Dr. Elizabeth Litzler  
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# WEPAN 2011-2012 Webinar Series



- **Host: Diane Matt**, Executive Director, WEPAN (Women in Engineering ProActive Network)



- **Moderator: Jenna Carpenter**, Ph.D., Associate Dean; College of Engineering & Science, Louisiana Tech University; Director of Professional Development, WEPAN BOD



- **Presenter: Dr. Elizabeth Litzler**, Center for Workforce Development, University of

# Housekeeping Information

- **The webinar will use Voice Over Internet. If the sound quality is not good, a teleconference line is available:**
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# How to Ask a Question

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- **Participant microphones are muted for webinar quality.**
- **Type your question in the “Question” space in the webinar control panel.**
- **A presenter will respond as time allows.**

# What's WEPAN? [www.wepan.org](http://www.wepan.org)

- WEPAN's Core Purpose: To propel higher education to increase the number and advance the prominence of diverse communities of women in engineering.
- WEPAN's Core Values: Knowledge of research, statistics, pedagogy, and practice relevant to women in engineering and STEM is a way to drive change.
- WEPAN and Collaboration: Collaboration draws on strengths from many sectors and is key to advancing women in engineering.
- WEPAN and Diversity: Inclusion of diverse communities of women improves the field of engineering itself.
- WEPAN and Leadership: Developing and influencing leadership is pivotal to advancing the success of women in engineering.



# WEPAN Knowledge Center

<http://wepanknowledgecenter.org>

**Goal: Increase the number, scope and effectiveness of initiatives to advance women in engineering.**

- **Catalogued and fully cited resources**

Research, reports, data and statistics, agenda papers, bibliographies, best practices, key programs, and more—1,000+

- **Online Professional Community**

Network, collaborate, identify experts, share information

- **Special online events**

Feature WKC Professional Community and networking opportunities

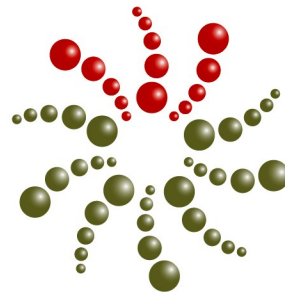
- **Use** the research, information & data, **Submit** & suggest resources, **Share** the WKC with colleagues



# Who's on the Call Today

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- **We have 250 registered participants.**
- **Thank you to ASEE WIED, ASEE CMC, ASEE ERM, NAPE Stem Equity Pipeline, PGEList, ADVANCE, and others for helping us spread the word!**
- **The recorded webinar and slides will be posted on the WEPAN Knowledge Center.**



**WE**PAN

Women in  
Engineering  
ProActive  
Network

*Transforming culture  
in engineering education*



# **Some Here, More There: What Attracts Women to Engineering Majors?**

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CENTER FOR WORKFORCE DEVELOPMENT

UNIVERSITY *of* WASHINGTON

College of Engineering

# Some Here, More There: What Attracts Women to Engineering Majors?

Elizabeth Litzler

**PAGE**  
*project to assess climate in engineering*



# Agenda

Background and Theory



Proportion Women in Engineering



Proportion Women in Engineering Majors



Individual: Attracting students to majors with most or least proportion women  
(21 schools, 9 majors)

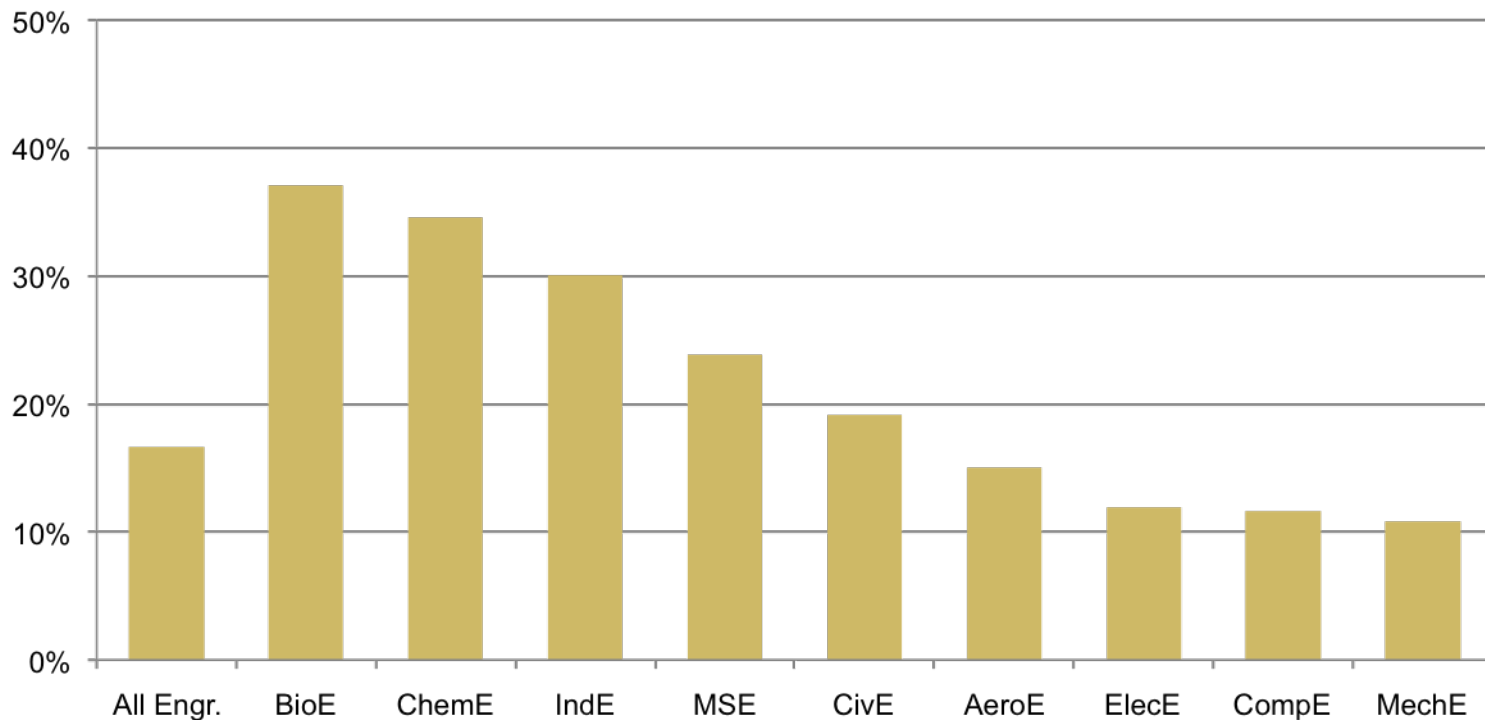


Meso: Aggregate characteristics of majors with % of women higher or lower than engineering average  
(13 schools, 5 majors)



# Background

- Women represent more than half of the students in post-secondary education today (NCES 2008)





# Theoretical Perspectives Used

## Human Capital

- Gender, Race/Ethnicity
- GPA, Engr. Course in HS

## Status Beliefs

- Family friendly, Positive view Engr., Engr. confidence
- Intend to graduate, Coursework prepare for job

## Hostile Climate

- Passive: stereotypes, community, help others
- Overt: singled out, sexual harassment

## Institution Char.

- Size, Research level, ranking, female faculty

# Predictions based on Theory

Students in Male-dominated majors will have:

- High self-confidence
- High self-efficacy
- More preparation, greater skill investment
- Hostile, unwelcoming culture
- More discrimination

Students in less Male-dominated majors will have:

- Greater perceptions of work-family flexibility
- Greater sense of community
- Greater sense of support
- Greater proportion female faculty

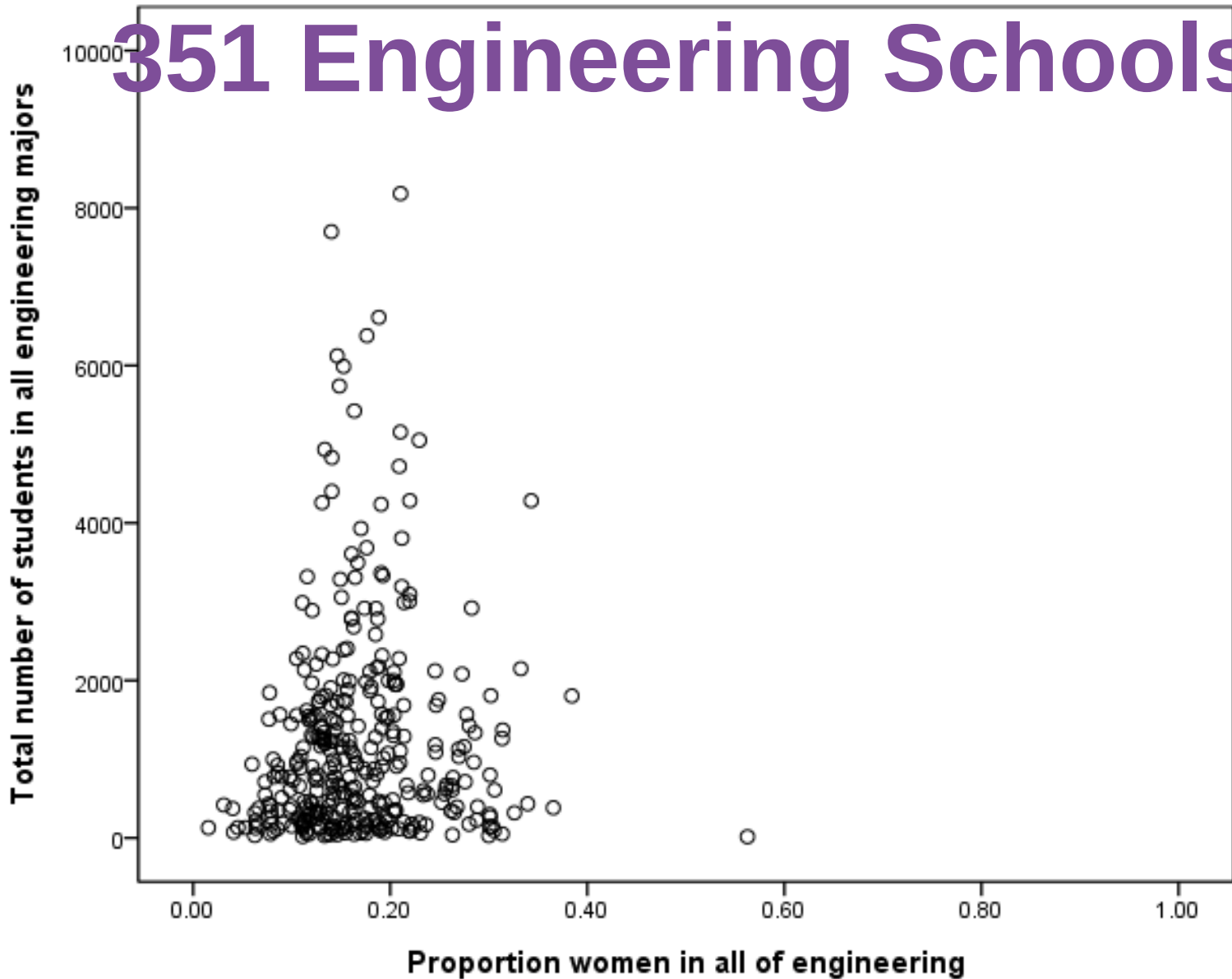
Some effects stronger for women than men

# Data

- Engineering Workforce Commission (EWC)
  - Fall 2007 undergraduate engineering enrollments by sex and major
  - 351 engineering schools
- Project to Assess Climate in Engineering (PACE)
  - 10,554 survey respondents across 21 schools, 2008
  - Alfred P. Sloan Foundation funded UW Center for Workforce Development



# 351 Engineering Schools

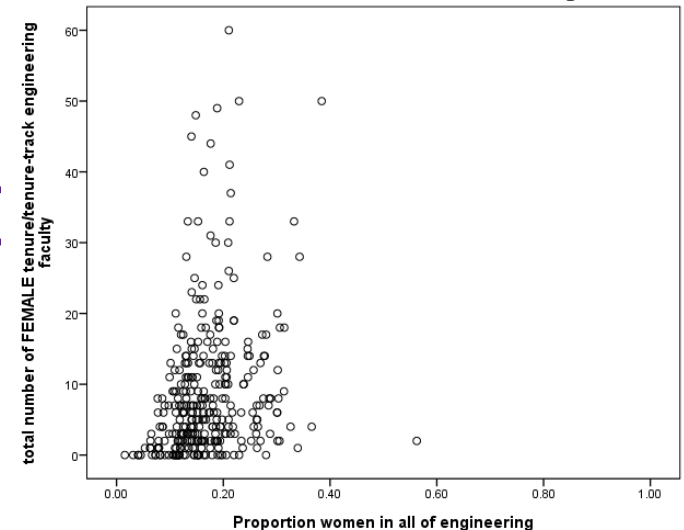


# Correlations with proportion women

## Higher Proportion Women (School level)

- Very High Research Activity
- Private
- Has Female Majors
- Large City
- US NEWS Top 50, Top 100
- Higher # Female Faculty

**% of Women in Engineering  
by  
# of Female Faculty**





Aerospace

Bioengineering

# Proportion Women in Major

Chemical

Civil & Construction

Computer

Electrical & Electronics

All Other Industrial

Materials & Metallurgy

Mechanical

**National  
Data**

Proportion  
Women in  
Major (x)

by

Size of  
Engineerin  
g College  
(y)



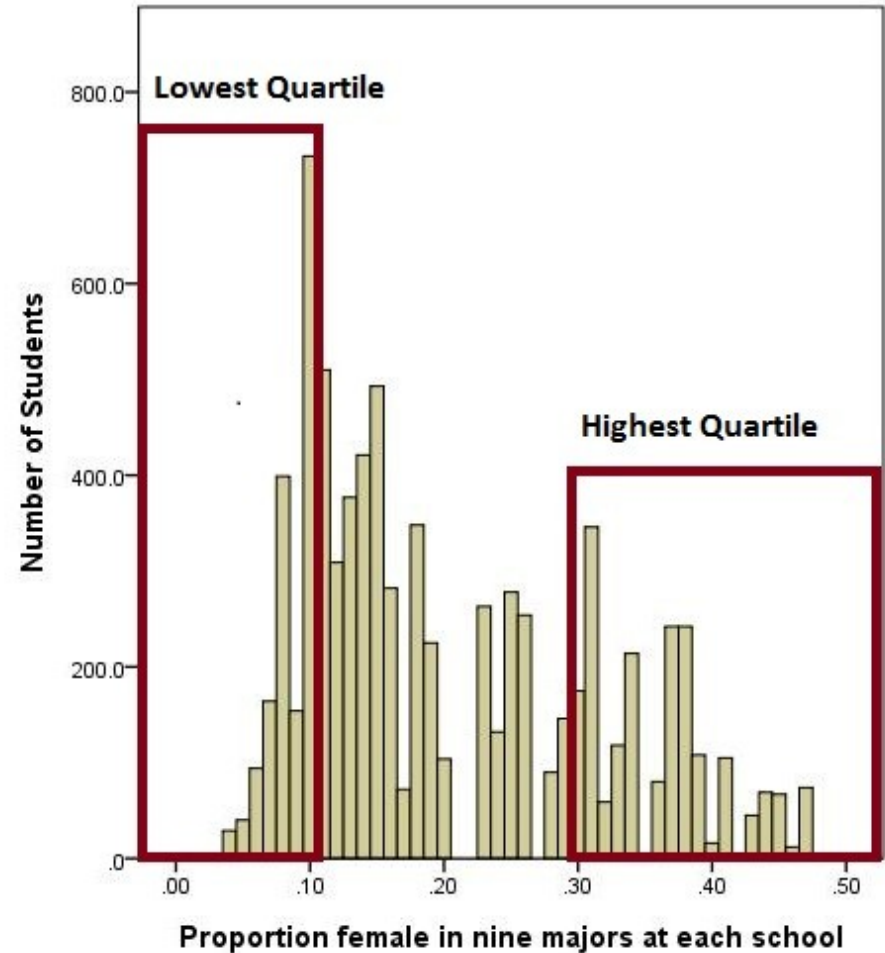
# Proportion Women in Engineering (Majors) Results Summary

- Large variation within majors and across schools
- Context of the major/school matters
- Content, by itself, does not drive female interest

# Relationship of Student Perceptions to Location in a

Major

- PACE survey data, matched with Carnegie
- Highest and lowest quartile proportion women in major
- 21 schools, nine majors





# Highest Quartile=1 and Lowest Quartile =0 (21 schools)

	All Students	Female	Male
Female	5.95 ***	---	---
Engr Community	1.28 *	1.62 **	1.12
Professors Care (centered)	1.12 *	1.04	1.16 *
Family Friendly (centered)	1.11 *	1.03	1.21 *
Prior Engr Experience	0.44 ***	0.35 ***	0.48 ***
Gender Stereotypes	0.69 *	0.71	0.64
Intend to Graduate	0.72 *	0.62	0.85
Singled Out b/c Gender	0.97	0.77	6.76 *
Unexplained school level variation (ICC)	0.73	0.30	0.68
N	2991	1282	1709

# Summary- Individual level

- Fewer differences between women in high and low quartiles than men in high and low quartiles
- For women, less variation is attributable to the variation between schools (30% vs. ~70%)

## Unexpected -

- Males feel unfairly singled out in majors with higher proportion of women

# Analysis at Level of the Major

- PACE individual survey data is aggregated up to level of the major
- 5 majors across 13 schools=65 cases
- Weighted Least Squares
- Representation Ratio: Greater than 1=higher representation in that major than in engineering overall
- Other non-PACE variables included (Salary, Major and school rank, Carnegie RUVH)

# Summary: Major Level (65 cases)

## Representation Ratio

- Positive View of Engineering (respected, contribute to society) (.53)
- Professors Care about Student Learning (.60)
- Students Help Others Succeed (.45)
- Proportion Female in

## Representation Ratio

- Engineering Community (-.31)
- Carnegie Very High Research (RUVH) schools (-.64)



# Overall Findings I

- Wide variation in women's representation: Student experiences, environment matters
- School level characteristics (unmeasured) matter quite a bit for men's choice of major with high or low proportion of women.
- Individual, interactional and environmental characteristics are more important for women's choice of major than school level differences.





## Overall Findings II

- Schools with higher proportion of women
  - High and very high research activity, higher # female faculty, ranked in top 100
- Prior engineering experience strong across all models



# Recommendations

- 10,000 STEM teachers (high school)
- Outreach - Keep doing it!
- Environment of major matters-
  - Professor-student interaction
  - Sense of Community

Thank You!

# Questions?

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- **Remember:**
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# Thank You!



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