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

Dr. Elizabeth Litzler
University of Washington
Center for Workforce Development
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...
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• A presenter will respond as time allows.
What’s WEPAN? 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.
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

- 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.
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What Attracts Women to Engineering Majors?

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Elizabeth Litzler
Agenda

1. Background and Theory
2. Proportion Women in Engineering
3. Proportion Women in Engineering Majors
4. Individual: Attracting students to majors with most or least proportion women (21 schools, 9 majors)
5. 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, unwelcome 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
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)

<table>
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<tr>
<th></th>
<th>All Students</th>
<th>Female</th>
<th>Male</th>
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<tbody>
<tr>
<td>Female</td>
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<td>---</td>
<td>---</td>
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<tr>
<td>Engr Community</td>
<td>1.28 *</td>
<td>1.62 **</td>
<td>1.12</td>
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<tr>
<td>Professors Care (centered)</td>
<td>1.12 *</td>
<td>1.04</td>
<td>1.16 *</td>
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<tr>
<td>Family Friendly (centered)</td>
<td>1.11 *</td>
<td>1.03</td>
<td>1.21 *</td>
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<td>0.35 ***</td>
<td>0.48 ***</td>
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<tr>
<td>Gender Stereotypes</td>
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<td>0.71</td>
<td>0.64</td>
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<tr>
<td>Intend to Graduate</td>
<td>0.72 *</td>
<td>0.62</td>
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<td>Singled Out b/c Gender</td>
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<td>6.76 *</td>
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</tbody>
</table>

Odds Ratios Reported
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 Major (5.25)

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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