Women in engineering: Interests, perspectives, confidence ...and experiences

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Acknowledgements

Current and former advisory board members


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(image courtesy M. Klause)

Academic Pathways Study

Sheri Sheppard, Lead

Large-scale, multi-method study of undergraduate engineering students

3 cohorts of engineering student participants

Multiple groups of early-career engineers

Additional analysis of national survey data

Research on the engineering learning experience from the student perspective

Sampling of APS findings

Large variation in student pathways...

Reasons for choosing engineering

Choosing to stay to go

Navigation through curriculum

Experience by gender

Acquisition of engineering knowledge & skills

Preparation for “the real world”

Two parts of APS

APPLES2 Survey

Sheri Sheppard, Lead

Cross-sectional (class standing)
4,266 students at 21 engineering colleges

Engineering Thinking & Doing (ETD)

Cindy Atman, Lead

Multi-method, longitudinal study
Approx. 160 students at four campuses
Conceptions of engineering and design
Performance on engineering design tasks
1. Diverse interests

- Extracurricular activities, engineering and non-engineering
  - Women tend to participate more than men do in both kinds of activities (first and senior years).***
  - Women tend to place greater importance on non-engineering extracurricular activities than men do (seniors).**

***$p < 0.001$, **$p < 0.01$

2. Diverse perspectives

...on engineering skills

- As seniors, women tend to place greater importance on professional and interpersonal skills than men do.***
  - Leadership
  - Performing in teams
  - Communication
  - Public speaking
  - ...

***$p < 0.001$

More about this in the confidence section

2. Diverse perspectives

...on design problems

- Considering context when approaching engineering design problems
  - Selecting information for playground design
    - Closed-ended survey question
    - Years 1 and 4
  - Factors considered for "Midwest floods" design task
    - 10-minute, paper-and-pencil design task
    - Years 1 and 3

Playground design question

"You have been asked to design a playground...From the following list, please put a check mark next to the FIVE kinds of information you would MOST LIKELY NEED as you work on your design:

- Availability of materials
- Body proportions
- Budget
- Handicapped accessibility
- Information about the area
- Labor availability and cost
- Legal liability
- Maintenance concerns
- Material costs
- Material specifications
- Neighborhood demographics
- Neighborhood opinions
- Safety
- Supervision concerns
- Technical references
- Utilities
**Midwest floods design task**

“Over the summer the Midwest experienced massive flooding of the Mississippi River. What factors would you take into account in designing a retaining wall system for the Mississippi?”

**Floods: Contextual factors**

- **Broad context factors**
  - “aesthetic appeal – is it going to draw local complaint?”
  - “the surrounding habitat – make sure little or no damage is done to the environment”
  - “would wall impact use of the river by industry?”

- **Close context factors**
  - “cost of materials”
  - “check the budget available for the operation”
  - “how to contain the river water that has flooded out”

**Floods: Total factors**

- Men respond with fewer factors in both years.

**Floods: Broad & close context**

- Men cite fewer broad context factors in both years.
3. Differences in confidence

<table>
<thead>
<tr>
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<th>Confidence</th>
<th>Year(s)</th>
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<tr>
<td>Math &amp; science ability</td>
<td>women &lt; men</td>
<td>Years 1 &amp; 4</td>
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<td>Open-ended problem-solving</td>
<td>women &lt; men</td>
<td>Year 4</td>
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<tr>
<td>ability</td>
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<tr>
<td>Specific design activities</td>
<td>women &lt; men</td>
<td>Year 2</td>
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<td>Professional and</td>
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<td>Years 1 &amp; 4</td>
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<tr>
<td>interpersonal skills</td>
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</table>

***p < 0.001, **p < 0.01

4. Experiences

- As seniors, women tend to report experiencing more curricular overload,*** which is negatively correlated with...
  - Satisfaction with instructors
  - GPA
- Women tend to report more pressure to balance social and academic life (seniors,*** first-years***)

**p < 0.01, ***p < 0.001

Summary

- Women bring broader interests and perspectives to engineering
- ...but can be less confident in certain respects
- ...and report challenges with overload and balance.

What kind of engineering education experiences can we provide in response?

Implications?

- How might women’s interests, perspectives, and confidence affect their experiences as engineering undergraduates?
- Conversely, how might their experiences affect their interests, perspectives, and confidence?

Consider your students’ experiences, successful student support programs, other research...

Please share your thoughts on the provided discussion notes pages. They will be transcribed and published to the web anonymously, so please write legibly!
Wrapping up

- Strength of the multi-method, multi-institution approach
- Instruments that can be used on your campus
- Variety of findings across many aspects of the student experience

We hope to hear more from you...

http://www.engr.washington.edu/caee/

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