Engineering thinking and doing:
Gender differences in first-year students

Ken Yasuhara, Deborah Kilgore,* Theresa Barker, Jason Saleem, Cindy Atman

Engineering Thinking & Doing Group, Academic Pathways Study
Center for the Advancement of Engineering Education
Center for Engineering Learning and Teaching
*contact author: kilgored@u.washington.edu

Academic Pathways Study

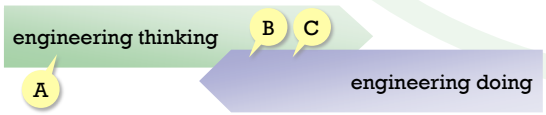
We present preliminary findings from the APS, a longitudinal, multi-institutional, mixed-methods study of engineering students that started in 2003.

- four institutions of varying type
- ~160 engineering students, women oversampled (38% F)
- mixed methods: survey, performance task, interviews, observation

Engineering Thinking & Doing Group

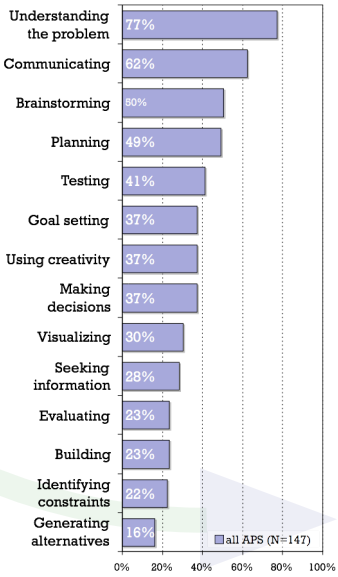
Within the APS team, our group focuses on how engineering students conceive of engineering, as well as how they perform engineering tasks. This poster presents three findings based on freshman data.

A. **What aspects of engineering design** do freshmen consider most important?
B. **What kinds of information** do freshmen prioritize in approaching an engineering design problem?
C. **How broadly do freshmen think** when approaching an engineering design problem?



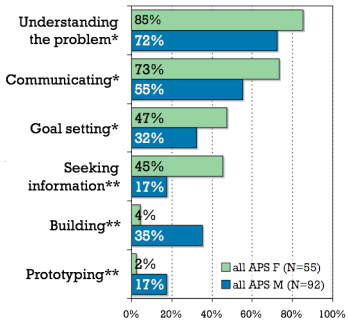
A. Aspects of design

In the survey, we gave students a list of 23 design activities and asked them to choose the six most important.



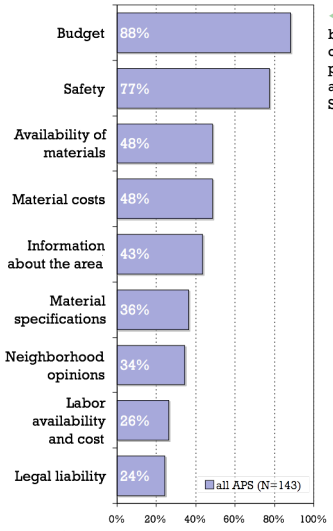
◀ Most frequently chosen items, in decreasing order by % participants. Less than 15% of participants chose Imagining, Modeling, Prototyping, Abstracting, Making trade-offs, Decomposing, Synthesizing, Sketching, Iterating.

▼ Items with statistically significant gender difference (*$p < 0.10$ or **$p < 0.05$, Fisher exact)



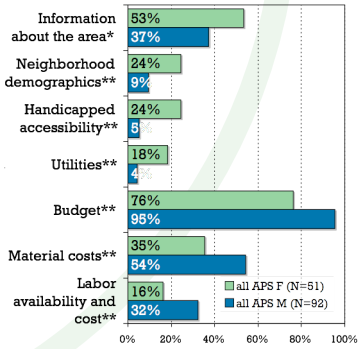
B. Prioritizing information

In the survey, we asked students to imagine designing a playground. From a list of 16 kinds of information, we asked them to choose the five they would most likely need as they work on their design.



◀ Most frequently chosen items, in decreasing order by % participants. Less than 15% of participants chose Neighborhood demographics, Body proportions, Maintenance concerns, Handicapped accessibility, Technical references, Utilities, and Supervision concerns.

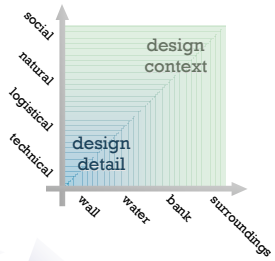
▼ Items with statistically significant gender difference (*$p < 0.10$ or **$p < 0.05$, Fisher exact)



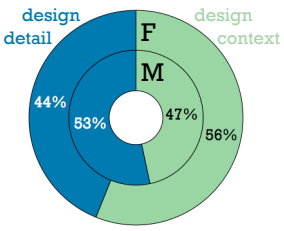
C. Thinking broadly

In the performance task, we asked students to write about the factors they would take into account in designing a retaining wall system to handle flooding of the Mississippi River.

▼ We categorized the ideas expressed in their responses as pertaining to "design detail" vs. "design context".



▼ Ideas by category and by gender. (all APS N=51 F + 92 M)



What do you see in the data?

- Do women tend to consider problem context more than men?
- Do women tend toward planning and preparation in engineering design, while men tend toward more hands-on experimentation?
- (your themes here)

Acknowledgements

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