Does Major Matter?

A Look at what Motivates Engineering Students in Different Majors

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Are Students of Different Engineering Majors Motivated by Similar Factors?

- Prior work has shown differences between men and women
  - mentor influence
  - intrinsic behavioral
  - attracted to different majors

- Prompted investigation into different majors
Academic Pathways of People Learning Engineering Survey (APPLES)

- One of several modes of data collection in Academic Pathways Study, a branch of the NSF-funded Center for the Advancement of Engineering Education
- 50 questions
  - about 10 minutes to complete online.
- **Who:** Over 4000 undergraduate participants
- **Where:** 21 U.S. institutions
- **When:** Spring of 2008 *(before the economic downturn)*
- **Incentive:** Participants were paid $4
- For more info … http://applesurvey.org
The Majors

- Mechanical Engineering
- Electrical Engineering
- Chemical Engineering
- Aerospace Engineering
- Industrial Engineering
- BioX Engineering
Number of Participants in Subset

- Juniors and seniors grouped together
- Analyzed women and men separately

<table>
<thead>
<tr>
<th>Engineering Field</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>BioX Engineering</td>
<td>51</td>
<td>54</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>106</td>
<td>389</td>
</tr>
<tr>
<td>Industrial Engineering</td>
<td>69</td>
<td>69</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>56</td>
<td>220</td>
</tr>
<tr>
<td>Chemical Engineering</td>
<td>60</td>
<td>42</td>
</tr>
<tr>
<td>Aerospace Engineering</td>
<td>127</td>
<td>25</td>
</tr>
</tbody>
</table>
Types of Motivation

• Intrinsic
  – Behavioral, 0.72, *I like to build stuff*
  – Psychological, 0.75, *I think engineering is interesting*

• Post Graduation
  – Social Good, 0.77, *Engineering skills can be used for the good of society*
  – Financial, 0.81, *Engineers are well paid*

• People
  – Mentor, 0.77, *A faculty member has encouraged or inspired me to study engineering*
  – Parental, 0.83, *My parents want me to be an engineer*
Intrinsic Behavioral Motivation

<table>
<thead>
<tr>
<th></th>
<th>Mechanical</th>
<th>Industrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>91.7</td>
<td>72.6</td>
</tr>
<tr>
<td>Women</td>
<td>82.5</td>
<td>55.3</td>
</tr>
</tbody>
</table>

Major and Gender Differences
- Some groups identify as their own group

↑ Indicates significant difference at p<0.001
Intrinsic Behavioral Motivation

Gender Similarity
- Men MEs are more like Men EEs
- Women MEs are more like Women EEs

Indicates significant difference at p<0.001
Intrinsic Behavioral Motivation

### Major Similarity
- Women ChemEs are more like Men ChemEs
- Women EEs are more like Men EEs
Intrinsic Behavioral Motivation

**Mechanical**

- **Men**: 91.7
- **Women**: 82.5

**Industrial**

- **Men**: 72.6
- **Women**: 55.3

**Chemical**

- **Men**: 75.4
- **Women**: 63.9

**Electrical**

- **Men**: 86.5
- **Women**: 86.1

**Mechanical**

- **Men**: 91.7
- **Women**: 82.5

**Electrical**

- **Men**: 86.5
- **Women**: 86.1

**Chemical**

- **Men**: 75.4
- **Women**: 63.9

**BioX**

- **Men**: 81.2
- **Women**: 72.2
Does Major Matter?

• It depends…
  
  – Averaging data for all engineering students may obscure differences between majors and genders.
  
  – Lumping all potential engineering students together may mean that we are leaving out some key groups.
Future Directions

• Include additional majors

• Look at additional motivational factors
Acknowledgements

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