ECEDHA Keynote

Diversity in Undergraduate ECE Education: Who comes and what happens to them?

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Overview

- This Session: Research and Data

- 10:30 – noon  *ECE Vision, Branding, & Community*

- Lunch

- 1:30–3 pm  *Diversity, Equity, & Inclusion: What can we do as ECE department heads?*
Outline

- Introduction
  - Data Source: MIDFIELD
  - Graphical Display: Dot plots
- Choosing EE/CpE
- Graduation in EE/CpE
- Trajectories in EE/CpE
- Comparison to other engineering disciplines
- Questions

Note: You will have time to briefly discuss with neighbor and write down important questions. Questions that remain can be part of next session today at 1:30!

Diversity, Equity, & Inclusion: What can we do as ECE depart. heads?
MIDFIELD data

The Multi-Institution Database for Investigating Engineering Longitudinal Development

- 11 public universities (mostly Southeastern U.S.A., but expanding)
- 1/9 of U.S.A. engineering graduates
- 2 Historically Black Colleges/Universities (HBCU)
- Over 1 million unique students over a 20–year period including over 200,000 engineering students. Growing to over 10 million over 25 years.
“Understanding diverse pathways: Disciplinary trajectories of engineering students”

Examining trajectories of students in EE and CpE disaggregated by race/ethnicity and gender

- i.e. How do Black men do in EE?
- How do Latinas do in CpE?
- Importance of intersectional approach

Part of larger NSF-funded project looking at

- EE and CpE
- Aero, Chemical, Civil, Industrial, and Mechanical Engineering
We seek engagement with the ECE community – these are *our* students.

- Share results with ECE stakeholders (*dept heads*, faculty, staff, etc.)
- Discuss how these results resonate with the ECE community
- Explore possible explanations for these results
- Generate ideas for future work
Our population

All engineering disciplines
- N = 93,629 first-time in college (FTIC) students
- N = 26,350 transfer students
- Asian, Black, Hispanic, and White students

Pathways: students who
- matriculate directly into EE or CpE
- matriculate into EE or CpE after a First-Year Engineering (FYE) program
- switch into EE or CpE (FTICs)
- choose EE or CpE at any time (transfer students)
White males are the majority sub-population of engineering matriculants.
The only data value encoded by a bar is its endpoint.
Removing the bars visually disconnects labels and data.
The horizontal lines reconnect labels to data. Dot offsets are unnecessary.
The final “dot plot” facilitates visual comparisons.

![Dot plot showing matriculants in thousands for different ethnic groups and genders in engineering.](image-url)
Choosing EE or CpE

<table>
<thead>
<tr>
<th>Race/Ethnicity/Gender</th>
<th>At schools with EE</th>
<th></th>
<th>At schools with CpE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ENGR</td>
<td>EE</td>
<td>ENGR</td>
<td>CpE</td>
</tr>
<tr>
<td>White Male</td>
<td>59,424</td>
<td>8942</td>
<td>56,979</td>
<td>5127</td>
</tr>
<tr>
<td>Black Male</td>
<td>6026</td>
<td>1823</td>
<td>3498</td>
<td>435</td>
</tr>
<tr>
<td>Asian Male</td>
<td>4110</td>
<td>1048</td>
<td>4015</td>
<td>611</td>
</tr>
<tr>
<td>Hispanic Male</td>
<td>1937</td>
<td>337</td>
<td>1812</td>
<td>191</td>
</tr>
<tr>
<td>White Female</td>
<td>13,847</td>
<td>1020</td>
<td>13,394</td>
<td>386</td>
</tr>
<tr>
<td>Black Female</td>
<td>3555</td>
<td>773</td>
<td>2017</td>
<td>243</td>
</tr>
<tr>
<td>Asian Female</td>
<td>1124</td>
<td>157</td>
<td>1103</td>
<td>102</td>
</tr>
<tr>
<td>Hispanic Female</td>
<td>531</td>
<td>51</td>
<td>510</td>
<td>20</td>
</tr>
<tr>
<td>All Male</td>
<td>71,497</td>
<td>12,151</td>
<td>66,304</td>
<td>6364</td>
</tr>
<tr>
<td>All Female</td>
<td>19,057</td>
<td>2001</td>
<td>17,024</td>
<td>750</td>
</tr>
<tr>
<td>All students</td>
<td>90,554</td>
<td>14,151</td>
<td>83,328</td>
<td>7115</td>
</tr>
</tbody>
</table>
Choosing EE/CpE: EE attracts a high percentage of Black matriculants, female and male.
Are these trends consistent with your experience? Why is this happening?
Graduation rates in EE and CpE

- EE grad rates are higher than CpE’s.
- Black students and Hispanic females in CpE have particularly low rates.
- Are these trends consistent with your experience?
- Why is this happening?
EE grad rates are higher than CpE’s. Black students and Hispanic females in CpE have particularly low rates.
Are these trends consistent with your experience? Why is this happening?
Trajectories in EE/CpE

- Trajectories differ by race/ethnicity.
- Are these trends consistent with your experience?
- Why is this happening?
Starters in the major

Years after matriculation

EE Male

N

3114
Starters in the major

Years after matriculation:
- 0 years:
  - A: 8942
  - B: 1048
  - W: 1823
- 4 years:
  - A: 588
  - B: 466
  - W: 3114

N
Starters in the major

N

Years after matriculation

EE Male

10,000
8,942
1823
1048
1000
337
100
10

3114
588
466
122
Starters in the major

N

Years after matriculation

EE Male

CpE Male
Starters in the major

N

Years after matriculation

EE Male | CpE Male | EE Female | CpE Female

W     | W     | W     | W

10000

W     | W     | W     | W

1000  

W     | W     | W     | W

100   

W     | W     | W     | W

10    

W     | W     | W     | W

1    

W     | W     | W     | W

0

0

0

0
All students in a major compared to starters in the major.
Transfers are taking the place of starters, concealing the high loss of starters.

Are these trends consistent with your experience?

Why is this happening?
“Stickiness” measures the success of all students who ever enroll in a major.

$$\text{Major Stickiness}_{EE} = \frac{N_{\text{graduated EE}}}{N_{\text{ever enrolled EE}}}$$

$$\text{Engineering Stickiness}_{EE} = \frac{N_{\text{graduated Engineering}}}{N_{\text{ever enrolled EE}}}$$

Includes students who
- matriculate directly into EE
- matriculate into EE after First-Year Engineering
- switch into EE (FTICs)
- choose EE at any time (transfer students)
Stickiness by Discipline

- **Engineering** stickiness includes major stickiness, so always greater.

- For all students, IE is most sticky EE is least
While $\approx 50\%$ of students who ever enroll in EE graduate in EE, $\approx 60\%$ graduate in some engineering major.

This $60\%$ rate is lower than for other disciplines—students who ever major in EE are more likely to leave engineering altogether than engineering students who never enroll in those disciplines.
Questions

Keep extra questions for the next session!

_Diversity, Equity, and Inclusion: What can we do as ECE department heads?_ Saturday March 19, 1:30 – 3 pm

More details available in

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