Transitions, Pathways, and Leverage Points for Engineers of Color

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Professor of the Practice
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Transitions, Pathways and Leverage Points for Engineers of Color

• Where are we today?
• Why the needle(s) are stuck
• A systems problem requires systems solutions
• The Engineering PLUS Alliance
• Q&A
Where Are We Today? The STEM Workforce

Demographic Composition of the STEM Workforce (%): 2010 and 2019

<table>
<thead>
<tr>
<th>Demographic Group</th>
<th>2010</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>HISPANIC/LATINX</td>
<td>5.5</td>
<td>7.7</td>
</tr>
<tr>
<td>AFRICAN AMERICAN/BLACK</td>
<td>6</td>
<td>7.1</td>
</tr>
<tr>
<td>AMERICAN INDIAN/ALASKAN NATIVE</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>WOMEN</td>
<td>41.9</td>
<td>44.2</td>
</tr>
<tr>
<td>Total Population (July 2021)</td>
<td>50.8</td>
<td></td>
</tr>
</tbody>
</table>

Where Are We Today? The Engineering Workforce

Demographic Composition of the Engineering Workforce (%): 2003 and 2017

<table>
<thead>
<tr>
<th></th>
<th>2003</th>
<th>2017</th>
<th>Total Population (July 2021)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Historically Underrepresented Groups (HURG)</td>
<td>9</td>
<td>12</td>
<td>33.5</td>
</tr>
<tr>
<td>Women</td>
<td>11</td>
<td>16</td>
<td>50.8</td>
</tr>
</tbody>
</table>

Despite Progress, Women and People from Historically Marginalized Racial and Ethnic Communities Remain Underrepresented in Engineering Degrees Granted

<table>
<thead>
<tr>
<th></th>
<th>Percent of total awards</th>
<th>2011</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Undergraduate</strong></td>
<td>Total Awards</td>
<td>77,802</td>
<td>130,309</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>18.9%</td>
<td>23.9%</td>
</tr>
<tr>
<td></td>
<td>BIPOC Men</td>
<td>14.7%</td>
<td>16.7%</td>
</tr>
<tr>
<td><strong>Graduate</strong></td>
<td>Total Awards</td>
<td>47,581</td>
<td>59,367</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>22.1%</td>
<td>26.4%</td>
</tr>
<tr>
<td></td>
<td>BIPOC Men</td>
<td>9.3%</td>
<td>8.3%</td>
</tr>
</tbody>
</table>

*Even though there is progress in the number and percent of women, it is still a discipline graduating predominantly male students*

Source: IPEDS
Where Are We Today? At The Transition Points

PERCENT OF NATIONAL GRADUATES AT EACH LEVEL FOR ENGINEERING STUDENTS FROM HISTORICALLY UNDERREPRESENTED GROUPS: 2020 GRADUATES

- Associates: 30%
- Bachelor's: 20%
- Graduate (Master's + PhD): 9%

Source: IPEDS
There Are Numerous Contributing Factors

Some academically disabling factors compound with each school level

**Elementary**
- Rationed education
- Teacher subject-matter proficiency
- Special education assignments
- 4th Grade Syndrome
- Skills deficits

**Middle School**
- “Elementary” factors plus
  - Tracking
  - Teacher expectations
  - Peer influence
  - Identity development
  - “Good at”/“Bad at”
  - Oppositional attitudes
  - Affirmation elsewhere (sports, music, clowning)
- High School preparation hindered

**High School**
- MS factors +
  - Rationed STEM education
  - Culture and Climate/Expectations
  - Identities reified
  - Expectations reified
  - “Good at”/“Bad at” reified
  - Aspirations reified
  - Academic self-efficacy reified
- College Readiness lacking

**College**
- HS factors +
  - Culture and Climate
  - Faculty Integration and Expectations
  - Academically-oriented social integration
  - Habits of Mind
  - Financial challenges
  - “Smartness” questioned

- Persistence is threatened
Multiple Dimensions of Achievement: Context Matters

Environment
- Faculty-student interactions
- Student-student cohesion
- Supervisor/peer cohesion
- Campus climate

Behavior
- Practice/Habits of Mind
- Time management & habits
- Effort/resilience
- Performance

Personal Factors
- Physical
- Emotions
- Attitude/Motivations

Identity
- Racial Identity
- Gender Identity
- Sexual Orientation...

Structural (Stimulus)

Individual (Response)

Self-Efficacy
"I Can"
There’s No Shortage of Best Practices

NSBE Impact Awards
- Recognized Exemplar Universities
- Sponsored by ExxonMobil

“Paving the Way” White Paper
- Nine Engagement Strategies + 3
- Literature Review, Best Practices & Challenges

Student Retention Toolkit
- Operationalizes the Engagement Strategies
- Print and Kindle Versions available on Amazon.com
A Systems Problem Requires a Systems Solution

"Your system is perfectly designed to give you the results you’re getting."

- W.E. Deming
Racial Inequity Defined: Why Change is So Difficult to Achieve

**Individual**
- Pre-judgement, bias, stereotypes or generalizations about an individual or group based on race

**Institutional**
- Policies, practice, and procedures that work to the benefit of white people and the detriment of people of color, usually unintentionally or inadvertently

**Structural**
- The interplay of policies, practices and programs of differing institutions ...that occurs within the context of racialized historical and cultural conditions

Source: Race and Social Justice Initiative
Bellwether Education Partners is exploring how organizations employ three impact strategies to address both the needs of the moment and long-term transformation in education.

**Direct Impact**
- How an organization provides programming directly to its target beneficiaries

**Widespread Impact**
- How an organization builds the capacity of partners to implement elements of its program model

**Systemic Impact**
- How an organization shifts mindsets, relationships and power to in turn shift policies, practices and resource flows to create stronger conditions for adoption of an organization’s program model and/ or its ultimate vision for change
These three strategies for impact are NOT mutually exclusive and in fact can reinforce each other

- **Direct Impact**
  - Serves students
  - Provides evidence and insights to shift systemic conditions

- **Widespread Impact**
  - Serves as a ‘test kitchen’ and demonstrates what works to be replicated
  - Enables broad adoption of direct impact model; funds R&D and creates lessons to share back to direct impact

- **Systemic Impact**
  - Creates systemic conditions that enable broader adoption of programs aligned to an org’s ultimate vision
  - Builds coalition and broader proof-points of program success; gain more visibility and credibility on what change is needed

- **Enables others to serve students**
Engineering PLUS
(Parnterships Launching Underrepresented Students)

Our Mission: **Transformative, systemic and sustainable change** that will increase the growth rate in the number of BIPOC and women obtaining undergraduate and graduate engineering degrees by 2026.

**NSF INCLUDES Alliance**

Award # 2119930

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Northeastern University

**Karen Horting, Co-PI**
Executive Director and CEO
Society of Women Engineers
The Engineering PLUS NSF INCLUDES Alliance will Achieve 100K/30K(BS/MS-PhD) degrees for BIPOC and Women by 2026.
Achieving Our Collective 100K/30K Goals Requires Systemic, Transformational Change

Source: IPEDS, and is a modification of the data included in the visualization tool created by Evelyn Yarzebinski of CRA for BPCnet.org
At a macro level we aspire to AMPLIFY BEST AND PROMISING PRACTICES to INCREASE THE PARTICIPATION of underrepresented populations obtaining engineering undergraduate and graduate degrees THROUGH SYSTEMIC CHANGE
The Engineering PLUS Ecosystem is intended to drive Systemic Change

- **Action Network Groups**: Scalable Strategies, SMEs, Stakeholder Buy-In
- **ENG PLUS Backbone**: Communication, Outreach
- **INCLUDES**: National Alliance Network
- **INCLUDES**: Coordination Hub

![Diagram](attachment:image.png)

- **Regional Hubs + Institutions/Faculty**: The Vehicles to Impact Institutional Change
- **Data / Analysis**

- **stEm PEER Scale-Up Academy**
- **stEm PEER Change Agents**

- **Literature**
  - Evidence-based Practices
  - Theoretical Frameworks

- **Research**
  - Analysis / White Papers
  - Peer-Reviewed Papers

- **Evaluation**
  - Continuous Improvement
  - Goals and Metrics
Engineering PLUS
stEm PEER
(Practitioners Enhancing Engineers Regionally)
Academy

“Be the change you want to see in the world.”
—Mahatma Gandhi

The stEm PEER Academy will investigate the following topics:

1. Understanding the Engineering Education Pathway Landscape with an emphasis on Diversity, Equity, and Inclusion.
2. Models and interventions that work for women and BIPOC students to enroll and facilitate degree attainment.
3. Building partnerships/engagement of stakeholders.
4. Planning, implementing, and assessing, and scaling the Capstone project.

The stEm PEER Academy seeks to train, empower, resource, and support a national network of stEm PEERs (educational change agents) who will accelerate implementation of high-impact, evidence-based practices to increase the number of engineering degrees awarded to women and BIPOC (Black, Indigenous, and Other People of Color) nationally.

Application process:
- Open: November 1
- Deadline: December 1
- Notifications: Available TBD

Applicants may also submit a letter of recommendation. Please complete the following question: “What has this program taught you that you will apply to your/this institution?”

Engineering PLUS is funded by the National Science Foundation (NSF) as a part of the NSF INCLUDES (Inclusion Across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science) Program.

NSF INCLUDES is a national initiative to strengthen U.S. global leadership by broadening participation in Science, Technology, Engineering, and Mathematics (STEM) and thereby reap the benefits of a more diverse, and innovative workforce.

The Engineering PLUS Alliance seeks to inform not only their specific CAPSTONE projects but to support and inform implementation of synergistic program efforts at their respective institutions and beyond. PEERs will be guided and supported to submit project outcomes as publications to CSAMP, ASEE and/or the National INCLUDES Network to inform future broadening participation collaborations. PEERs will launch a growing community of engineering education equity leaders.

Travel, housing, and meals will be provided. Additionally, each program participant will receive a $1,000 stipend to support their participation and continued engagement in this effort.

Visit: http://www.surveymonkey.com/s/stEm-PEER-Academy
How Do We Drive Systemic Impact?
#1 Inspire the Country with a Bold Goal
#2 Leverage Existing Networks and Funds of Knowledge
#4 Build in Accountability
#5 Recognize and Challenge Our “Agentic” Roles in Propagating Racial Inequities

“American racial biases persist over time and permeate (a) institutional structures, (b) societal structures, (c) individual mental structures, and (d) everyday interaction patterns. Systemic racism operates with or without intention and with or without awareness.”

Why Does Diversity Matter?

**DIVERSITY PRODUCES BONUSES!**

“Many of our complex challenges involve understanding the actions, preferences, and capabilities of diverse people.”

-Scott Page, University of Michigan
Questions, Comments, Discussion

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