Blue Collar STEM: The Big Picture

- STEM plays an important role in a nation’s technological innovation & economic growth*

- Two STEM economies: workers with 4-year & graduate degrees (‘white collar’) **AND** workers with high school, vocational training, or 2-year degrees (‘blue collar’)**

- Estimated 6M to 26M US STEM-based jobs total**

- For workers with less than a 4-year degree:
  - **6M** STEM jobs using narrow definition
  - **13M** STEM jobs using a skills-based definition
  - Context: 1M STEM workers with a PhD

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* Rising Above the Gathering Storm, National Academies 2007
** S&E Indicators and The Hidden STEM Economy, Brookings Institute 2013
Blue Collar STEM: What is It?

Blue Collar Workers – Who Are They?

- **Old View:** Professional workers in an office vs. workers performing manual labor in a blue uniform

- **We need a new definition.**
  - *Wired Magazine:* “The Next Big Blue-Collar Job Is Coding”
  - *Forbes:* “The Future of Digital Jobs is Blue Collar”

Blue Collar STEM

The technical skills and infrastructure required for workers with less than a 4-year degree to contribute to and take full advantage of today’s economy.
# Blue Collar STEM: Opportunities

<table>
<thead>
<tr>
<th>College (Traditional – White Collar)</th>
<th>Community College / Vocational Tech.</th>
<th>On-the-Job Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientist</td>
<td>Laboratory Managers</td>
<td>Technicians</td>
</tr>
<tr>
<td>Engineer</td>
<td>Equipment Managers</td>
<td>Testers</td>
</tr>
<tr>
<td>Designer</td>
<td>Data Managers</td>
<td>Mechanics</td>
</tr>
<tr>
<td>Theorist</td>
<td></td>
<td>IT workers</td>
</tr>
<tr>
<td>Mathematician</td>
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</tbody>
</table>
## Blue Collar STEM: Opportunities

<table>
<thead>
<tr>
<th></th>
<th>Mean STEM Score</th>
<th>High-STEM, Percentage of Jobs</th>
<th>Super-STEM, Percentage of Jobs</th>
<th>Share of U.S. High-STEM Jobs</th>
<th>Share of U.S. Super-STEM Jobs</th>
<th>Share of All Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture and engineering</td>
<td>10.6</td>
<td>100%</td>
<td>95%</td>
<td>9%</td>
<td>19%</td>
<td>2%</td>
</tr>
<tr>
<td>Life, physical, and social science</td>
<td>8.6</td>
<td>87%</td>
<td>76%</td>
<td>4%</td>
<td>7%</td>
<td>1%</td>
</tr>
<tr>
<td>Healthcare practitioner and technical</td>
<td>3.1</td>
<td>76%</td>
<td>29%</td>
<td>22%</td>
<td>19%</td>
<td>6%</td>
</tr>
<tr>
<td>Computer and mathematical science</td>
<td>2.9</td>
<td>100%</td>
<td>30%</td>
<td>13%</td>
<td>9%</td>
<td>3%</td>
</tr>
<tr>
<td>Installation, maintenance, and repair</td>
<td>2.6</td>
<td>53%</td>
<td>39%</td>
<td>10%</td>
<td>17%</td>
<td>4%</td>
</tr>
<tr>
<td>Management</td>
<td>1.1</td>
<td>27%</td>
<td>13%</td>
<td>6%</td>
<td>7%</td>
<td>5%</td>
</tr>
</tbody>
</table>

- **High-STEM jobs do not necessarily require a 4 year degree (50% using the Rothwell definition)**
- **High –STEM jobs with or without a 4 year degree see a wage premium – especially in computer programming/information technology**
- **Shortage of cybersecurity professionals – 209,000 in the US according to the Cybersecurity Business Report (2015)**
Blue Collar STEM: Opportunities at University Computing Centers

- Campus Cyberinfrastructure Engineer – BS degree or equivalent experience
- Senior HPC Systems Support Engineer – BS degree or six years equivalent experience
Blue Collar STEM: Opportunities

- These jobs provide opportunities for workers hard hit by changing domestic and global economy

- Blue Collar STEM jobs are well-paying*

- Unemployment rate of Blue Collar STEM workers is relatively low*

- Blue Collar STEM workers are more diverse (race/ethnicity,* geographic**)

- *S&E Indicators

- ** The Hidden STEM Economy, Brookings Institute 2013
Blue Collar STEM:
NSF Programs with Links to 2-year Colleges

- The NSF **Advanced Technical Education (ATE) Program** improves the education of technicians who work in advanced technology industries. Most often, these technicians are prepared for their jobs through associate degree programs in community colleges and related technology programs in secondary schools.

- The NSF **Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) Program** addresses the need for a high quality STEM workforce in areas of national priorities. The program seeks to increase and understand the success of low-income academically talented students with demonstrated financial need who are pursuing associate, baccalaureate, or graduate degrees in STEM.

- The **Cyber Corps: Scholarship for Service (SFS) Program** seeks to increase the number of qualified employees working for Federal, State, Local and Tribal governments in cybersecurity and to increase the capacity of the United States higher education enterprise to produce professionals in cybersecurity.
Blue Collar STEM: Further Questions

- **Blue Collar STEM** – good label or pejorative?
- Definition of **Blue Collar STEM** – too restrictive or too broad?
- What are the sectors containing **Blue Collar STEM** workers? Does that include auto repair workers, healthcare workers, others?
- Does the notion of **Blue Collar STEM** challenge the conventional notion of a 4 yr + degree is the only path towards career success?
- Is the shortage in **Blue Collar STEM** workers due to a stigma of the term blue collar?
Blue Collar STEM: Proposed Next Steps

- Form an internal working group to explore the issue, pinpoint NSF’s niche, research what else has been done…

- Stakeholder Outreach:
  - Industry
  - Skilled trade representatives
  - Defense
  - Educational institutions
  - Congress/Administration
  - Local/state governments
  - Professional Societies

- Report back to the NSB with focused objectives

- Organize and execute a 1-1.5 day symposium (Summer 2017) on Blue Collar STEM for these stakeholders discuss this issue and its impact on economic development and technological advancement