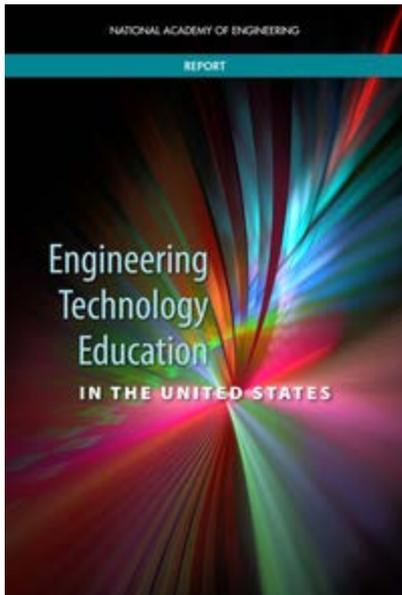


# Engineering Technology Education in the United States: Findings and Recommendations from an NAE Study



**NSF ATE Conference**

**Oct. 24, 2017**

**Mel Cossette, MatEdU  
Dan Hull, OP-TEC  
Greg Pearson, NAE (PI)**



NATIONAL ACADEMY OF ENGINEERING





# NSF/ATE Grant Award to NAE Study Elements

- **Literature review**
- **Analysis of federal education and employment data**
- **Survey of ET programs and employers of engineering/ET talent**
- **Workshop**
- **Report writing and peer review**



# Study Elements

**Significant Challenge: lack of data on 2-year degree status in employment datasets**

**Surveyed 650 individuals responsible for 527 4-year; 909 2-year ET programs**

**140 responded from 38 states and Puerto Rico**

**National Association of Colleges & Employers surveyed 1,000 corporate members – 250 responded**



# Cossette & Hull's Role in the Study

- **Selected and served on the Project Advisory Committee to represent technician education in two-year colleges and ATE.**
- **Prepared a supplemental paper entitled *Educational Pathways for Engineering Technicians*, published in the Summer 2017 issue of the NAE “Bridge”.**



# Trends in ET Degree Awards

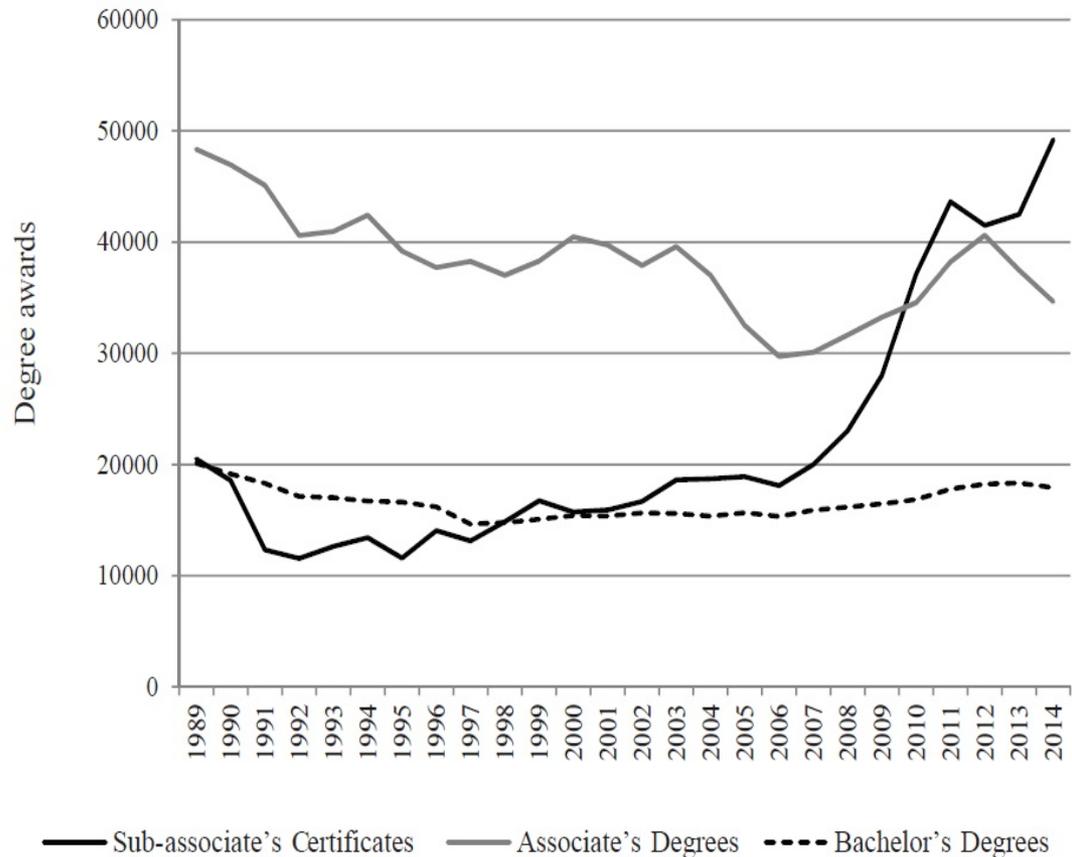
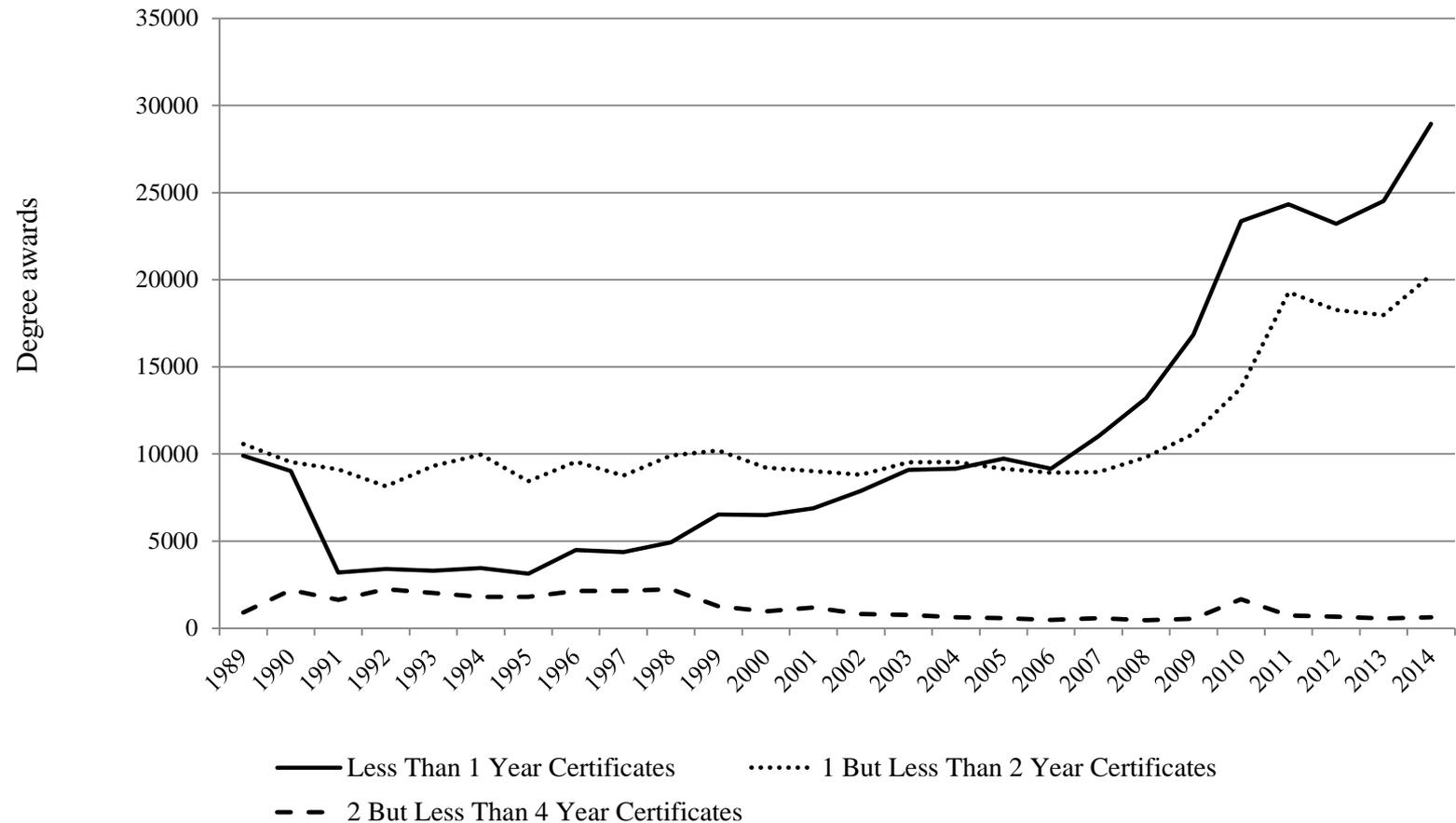


FIGURE 3-1 Engineering technician and technology degree production, 1989-2014.  
SOURCES: Calculations from IPEDS data; population of institutions from NCES.



# ET Certificates



# Diversity Among ET Grads

	Engineering Technology			Engineering	
	Total Population	Less Than 1-Year Certificates	Associate's Degrees	Bachelor's Degrees	Bachelor's Degrees
Race and ethnicity					
White, Non-Hispanic	62.1%	62.5%	63.1%	63.6%	61.5%
Black, Non-Hispanic	12.4%	14.8%	11.4%	10.7%	3.8%
Hispanic	17.4%	12.3%	13.0%	10.0%	9.6%
Asian or Pacific Islander	5.4%	2.7%	3.1%	3.9%	10.9%
American Indian or Alaska Native	0.7%	1.1%	1.0%	0.8%	0.3%
Other/Unknown Races & Ethnicities <sup>1</sup>	2.0%	5.8%	7.4%	7.2%	5.8%
Student visa	--	0.8%	0.9%	3.7%	8.0%
<b>All Females</b>	<b>50.8%</b>	<b>10.1%</b>	<b>12.4%</b>	<b>12.0%</b>	<b>19.8%</b>
Females, by race and ethnicity					
White, Non-Hispanic	31.5%	5.5%	7.2%	6.5%	11.2%
Black, Non-Hispanic	6.5%	1.5%	1.7%	2.1%	1.0%
Hispanic	8.6%	1.4%	1.7%	1.5%	2.1%
Asian or Pacific Islander	2.8%	0.6%	0.5%	0.5%	2.6%
American Indian or Alaska Native	0.4%	0.1%	0.2%	0.1%	0.1%
Other/Unknown Races & Ethnicities	1.0%	0.8%	0.9%	0.9%	1.2%
Student visa	--	0.2%	0.2%	0.5%	1.7%

SOURCES: Calculations from the 2014 IPEDS; population of institutions from NCES. Total population shares are from the US Census Bureau, with population-level race and ethnicity shares used for the female race and ethnicity shares.



# ET Workforce and Earnings

- **Of the 400,000 people working as ET technicians and technologists, the vast majority, about 85%, are technicians**
- **Engineering technicians have demonstrated the same annual earnings as engineering technologists for most of the past 40 years, with the current average at between \$46,000 and \$58,000, depending on the dataset**



# Worker Age and Shortages

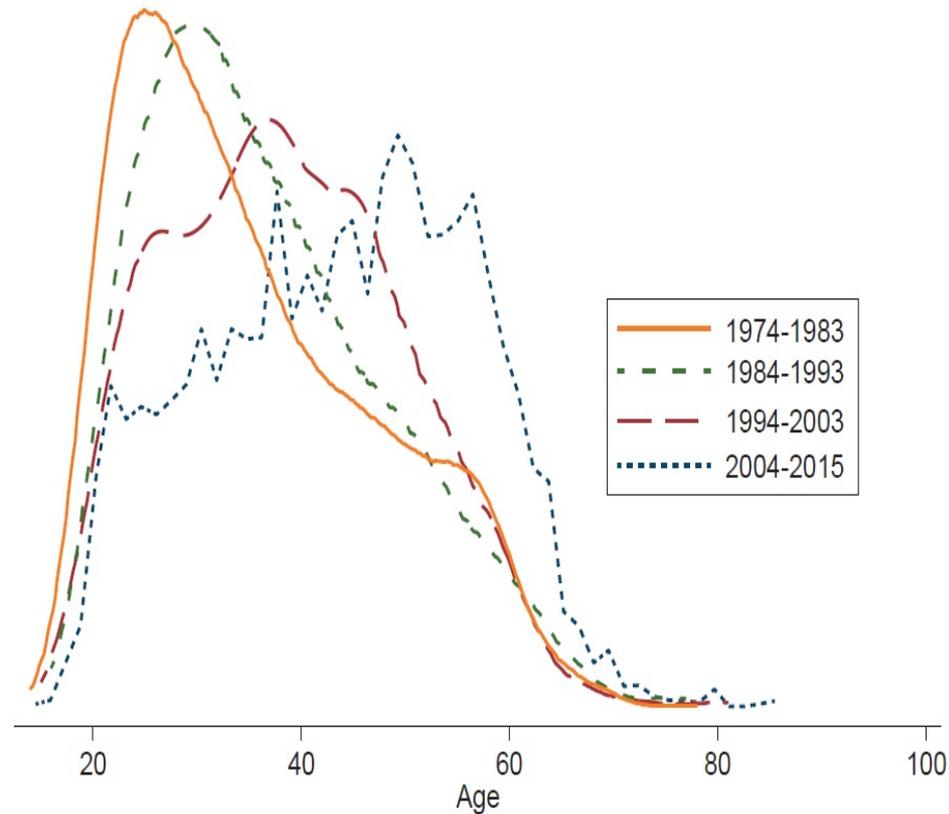


FIGURE 4-6 Age distribution of engineering technicians and technologists. SOURCE: Calculations from the 1974-2015 March CPS.



# Employer Views on Current and Future Supply of 2-Year ET Grads

	Yes	No	Don't Know
Sufficient <u>CURRENT</u> supply of applicants with 2-year degrees (N=102)	31.4	26.5	42.2
Sufficient <u>FUTURE</u> supply of applicants with 2-year degrees (N=44)	40.9	40.9	18.2



# Job Roles: 4-Year vs. 2-Year

	4-Year Percent (N=115)	2-Year Percent (N=47)
Troubleshooting and repairing equipment/technologies	74.8	66.0
Conducting quality control checks	67.8	55.3
Collecting and analyzing data	69.6	38.3
Testing or maintaining equipment/technologies	69.6	66.0
Building or setting up equipment/technologies	64.3	48.9
Designing new products or systems	53.9	8.5
Producing technical drawings	50.4	38.3
Managing the work of other technical staff	47.8	6.4
Creating mathematical, simulation-based, or physical models	40.9	0.0
Conducting experiments	25.2	23.4
Don't know	5.2	12.8
_ Other	3.5	6.4





# Selected Recommendations

- **Make the field's value proposition more evident to K-12 teachers, students, and students' parents, as well as to employers.**
- **Federal data collection efforts should capture more comprehensive data on individuals participating in sub-baccalaureate postsecondary education.**



**For more information:**

**Greg Pearson**  
**[gpearson@nae.edu](mailto:gpearson@nae.edu)**

**Report:**

**<https://www.nap.edu/catalog/23402>**



NATIONAL ACADEMY OF ENGINEERING

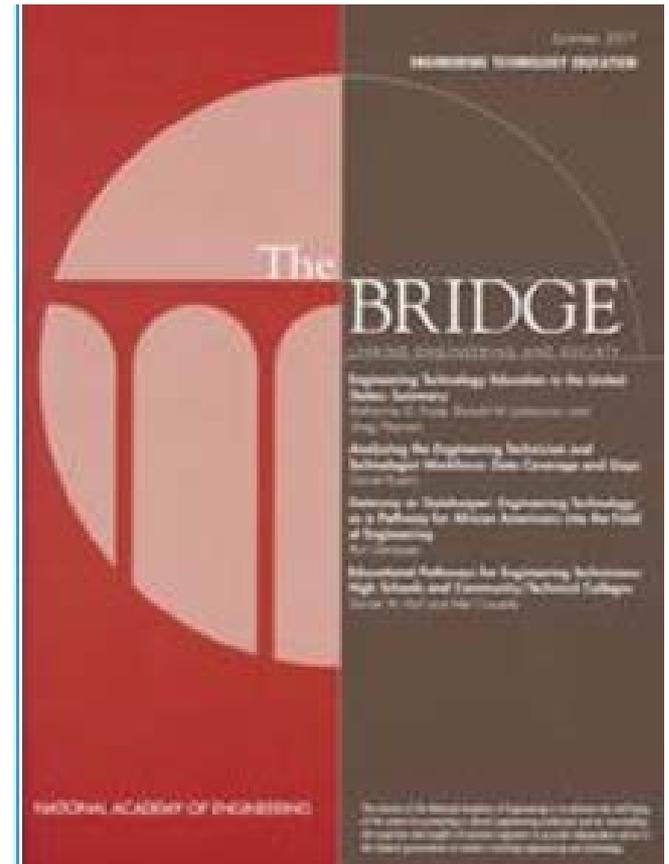


# ***Educational Pathways for Engineering Technicians***

---

A supplemental paper, authored by Hull and Cossette and published in the Summer 2017 issue of the NAE “The Bridge”. Copies are available.

Describes the urgent need for technicians and identifies strategies to broaden the technician workforce.



# Low Enrollments in ET Programs Pose a Threat That They May Be Closed

---

- Two year colleges are increasingly required to support program costs from tuition.
- Technician programs are particularly expensive because of required labs and equipment.
- Enrollments of <15 students are at risk.
- Ten photonics programs were closed since 2008; eight have been restored.
- Strong efforts are underway to increase enrollments and reduce attrition

# Recruiting and Preparing High School Students

---

- High School recruiting efforts that focus on a particular technical specialty are more effective than general college outreach.
- Current program students are effective recruiters.
- Target the recruiting to 2<sup>nd</sup> and 3<sup>rd</sup> quartile HS students; the capable “applied learners”.
- Most of these students will require stronger skills in math and problem-solving.
- Articulated, dual-credit programs are very useful. (See examples in **The Bridge** paper.)

# Postsecondary Internships

---

- **Win-Win scenario to all partners**
- **Helps prepare qualified candidates with basic skills and knowledge**
- **Supports/enhances student interest in a particular field**
- **Provides a structured experience**
- **Can support students financially**
- **Builds professional contacts**

# Recruiting and Preparing Adults

---

- **Adults with little or no college experience.**
- **Students at two-year colleges who have not declared a major.**
- **Returning veterans.**
- **Working adults who require specialized knowledge and skills.**
- **Unique recruitment strategies are required**
- **Most of these students will require remediation in math and science.**

# Additional Comments

---

**Some colleges attempt to design associate degree ET programs that will enable completers to easily articulate into BS degree engineering programs. To do this the AS degree programs will need to include courses in calculus and calculus-based physics. This is not recommended.**

**This practice would eliminate many “applied learners”; who are the most likely to enter colleges to become engineering technicians.**

---

**QUESTIONS?**

**COMMENTS?**

**DISCUSSION?**

A solid orange horizontal bar at the bottom of the slide.