The Value Proposition for Engineering Technology Education

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Presentation Overview

- About the National Academies
- Rationale for the Study
- Statement of Task
- Role of the Committee
- Work Plan
- Emerging Issues

The National Academies

- NAS act of incorporation signed by President Lincoln in 1863
- Established as a non-profit honorary and advisory body
- NRC, NAE, and IOM
- Members elected by peers
- Scale/scope of work

Sample of Engineering Education Reports

- Infusing Real World Experiences into Engineering Education
- Assuring the U.S. Department of Defense a Strong STEM Workforce
- Community Colleges in the Evolving STEM Education Landscape
- Educating the Engineer of 2020
- Engineering in K-12 Education
- Engineering Studies at Tribal Colleges and Universities
- Enhancing the Community College Pathway to Engineering Careers



Rationale for the Study

- Strong interest by policy makers, industry, educators in the US technical workforce
- Much of this interest has focused on the production and employment of engineers and scientists
- Relatively little attention has been given to either 4-year or 2-year engineering technology programs and their graduates, which contribute substantially to the workforce

By the Numbers: Part 1



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By the Numbers: Part 2

	IPEDS	B&B	CPS	ACS	NSCG	OES
DEGREE HOLDERS (2010)						
Stock of bachelor's degrees in engineering technology				465,773	404,584	
Newly awarded bachelor's degrees in engineering						
technology	16,843	15,143				
Stock of bachelor's degrees in engineering				4,689,099	3,471,339	
Newly awarded bachelor's degrees in engineering	74,339	88,534				
EMPLOYMENT (2010)						
Engineering technicians & technologists			382,899	401,846		440,060
Engineering technicians			300,343	331,199		
Engineering technologists			82,556	70,647	290,983	
Technician share of total			0.784	0.824		

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Questions from the Proposal

- **1.** How well does the supply of engineering technologists and technicians meet—or not meet—the needs of employers in different sectors of the economy?
- 2.What kinds of changes in curriculum are under way or needed to prepare graduates of these programs to best meet the challenges of globalization?
- **3.**What is the extent and significance of differences between the knowledge, skills, and dispositions needed for engineering technologists and those needed by engineers?

Statement of Task: Objective 1

Review the status and history of the production and employment of engineering technologists and technicians in the United States.



Statement of Task: Objective 2

Gather available data and explore private- and public-sector employer perceptions regarding the adequacy of the supply of engineering technologists and technicians as well as the appropriateness of the knowledge and skills they bring to the workplace.

Statement of Task: Objective 3

Describe the characteristics of U.S. engineering technology education programs related to such things as curriculum and faculty professional development; outreach to/ partnerships with K-12 schools, industry, and other organizations; and communication and collaboration with engineering education programs.

Committee

CO-CHAIRS

Katharine Frase, Vice President and Chief Technology Officer, IBM Public Sector **Ronald M. Latanision**, Senior Fellow, Exponent, Inc.

MEMBERS

Walter Buchanan, Professor, Texas A&M, Dept. of Engineering Technology and Industrial Distribution
Imelda (Mel) E. Cossette, Executive Director, National Resource Center for Materials Technology Education, Edmonds Community College
Werner Eikenbusch, Manager of Talent Management for Corporate HR, BMW Manufacturing Co., LLC
Christopher Fox, Manufacturing Engineering Teacher, Atholton High School, Howard County, Maryland
Joyce Gleason, Educational Consultant, Punta Gorda, Florida
Daniel Hull, Executive Director, National Center for Optics and Photonics Education
Sharon Levin, Emeritus Professor of Economics, University of Missouri, St. Louis
Jeffrey Ray, Dean and Professor, Kimmel School, Western Carolina University
Michael Richey, Associate Technical Fellow, The Boeing Company
Melvin Roberts, Associate Professor of Engineering, Camden County College
James L. Stone, Director, National Research Center for Career and Technical Education
Will Tyson, Associate Professor, Department of Sociology, University of South Florida



Role of the Committee

- Overseeing and planning project activities
- Preparing the report
- Responding to external review
- Conducting outreach

Work Plan

- Committee Meetings (March, June, Sept., Dec.)
- Data Gathering: literature review, analysis of existing datasets, commissioned papers, surveys, workshop
- Report Writing and External Review
- Report Publication and Outreach



Workshop: Save the Date!

When: Tuesday, Dec. 2, 2014

<u>What</u>: One-day event to share projectrelated data and get community input

<u>Where</u>: National Academy of Sciences Building, Washington, D.C.



Some Emerging Issues

- Value proposition
- Distinguishing ET from engineering
- Diversity
- Image and Branding

Value Proposition: Orientation to Application

As engineering programs began to move toward a more scientific and theoretical orientation, the applied nature of engineering became lost. Engineering programs began to add more physics, chemistry, and higher level mathematics courses to their engineering curriculum. Laboratory and shop courses were replaced by theoretical design and science courses. The hands-on nature of engineering technology filled this "applied" vacuum and moved engineering technology toward becoming what engineering used to be.

--Ron Dempsey, Engineering's Gateway or Gatekeeper: The Role of Engineering Technology within the Racially Stratified Structure of Engineering (2014)

Value Proposition: A Nurse to Engineering's Doctor?

Students who possess these skills are capable of holding entrylevel jobs as engineers, but without a more extensive grounding in mathematics, science, and design, they are ill equipped to proceed on to higher levels of engineering practice. While it is still too early to say how these new programs will be integrated into the profession as a whole, it seems likely that practitioners trained in engineering technology will serve in technical and professional support roles comparable to those filled by nurses and medical technicians in the practice of medicine.

--National Research Council, Engineering Education and Practice in the United States—Engineering Technology Education (1985)

How to Distinguish ET from Engineering?

Curriculum differences Hiring and work performed

- ETC 2012 survey of employers: focus on function
- NAE surveys of employers and educators
- Views of degree holders

How ET Degree Holders View Themselves

Table 16. Occupational distribution of engineering technology majors

	Number	Percent
Computer and IT occupations	34,214	10.13%
Engineer	67,681	20.04%
Manager	79,338	23.49%
Engineering technologist	29,415	8.71%
Sales	26,253	7.77%
Other	100,891	29.87%
Total	337,792	100.00%

Source: Author's calculations from the 2010 NSCG

Diversity

	Engineering Tec	Engineering		
_	<1 Year Certificate	AAS/AS	BS	BS
White, Non- Hispanic	62.5%	65.1%	69.7%	64.5%
Black, Non- Hispanic	<mark>16.3%</mark>	11.3%	<mark>9.1%</mark>	<mark>4.1%</mark>
Hispanic	11.3%	12.8%	8.0%	8.0%
Asian or Pacific Islander	2.7%	3.7%	3.7%	11.3%
American Indian or Alaska Native	1.3%	1.0%	0.8%	0.5%
Other/Unknown Races & Ethnicities	5.4%	5.1%	6.2%	5.5%
Temporary Resident	0.5%	1.0%	2.5%	6.1%
All Females	9.2%	13.6%	<mark>12.2%</mark>	<mark>18.4%</mark>

Image

Engineering technology is not very well understood. To a substantial extent this is true for those in academia and in industry. Hence, when engineering technology issues are discussed, the exchange of opinions may be dominated by oft- repeated stereotypical images. Such stereotypes, which while true to some extent, are indeed only partially true. For example, the lesser emphasis on theory and mathematical rigor causes engineering technology to be viewed as inferior to engineering, that is, engineering-light. This is perhaps the most damaging stereotype.

--Kelnhofer et al., Future of Engineering Technology, ASEE Conference Proceedings (2010)

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... and Branding

The degree is Engineering Technology, the career is engineering. --ETC/ASEE website



Thank You!

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