



Engineering Education and Workforce
WG
Progress Report

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Working Group Members



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Report Framework



- (I) Current Context and Trends**
- (II) Overarching Goals for NSF Eng Education**
- (III) Engineering Education in Engineering Directorate
- (IV) NSF Engineering Education Beyond Engineering Directorate
- (V) Next Steps: Potential NSF Investments**



What Do We Know-or Not?



- “Do we have enough engineers for the next decade?”
- Are our curricula forward looking”
- What are 11th graders thinking?
- BLS says annual growth rate in demand for engineers is 1% for next 10 years
- U.S. Trade Balance is **-.5** tril/year!

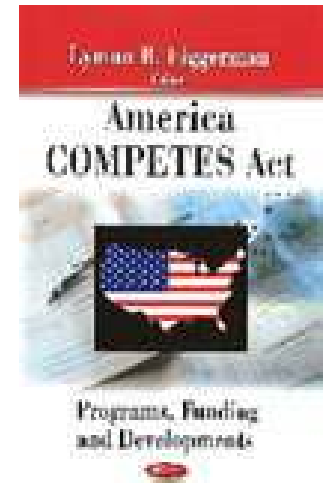


Engineering Education: The Players

- Contemporary literature (NSB, ASEE, NAE)
- NSF History
 - a) EHR Directorate
 - b) Engineering Education Coalitions (1990s)
 - c) EEC Research Program (2000s)
 - d) 25%(or so) of Eng budget for grad students
- Engineering Education Working Group
Viewpoints (right path or not?)

NSF and Engineering Education (Beacon or Flagship?)





7300
Engineering
Ph.D.s



3.5 million high
school graduations



Carl D. Perkins
Vocational and Technical Education Act of 2006

16 million
college
students



1.5 million
Engineers



K-12 Engineering
Education (200 mil)





Influential Reports/Studies



- *Engineer of 2020*
- *Educating the Engineer of 2020*
- *Engineering for a Changing World*
- *Moving Forward to Improve Engineering Education*
- *Enhancing the Community College Pathway*
- *Academic Competitiveness Council*
- *Urban Institute (shortage a myth!)*



Fundamental Issue



- **Professional preparation or academic discipline?**
“Undergraduate engineering should be restructured as an academic discipline, similar to other liberal arts disciplines in the sciences, arts and humanities, thereby providing students with more flexibility to benefit broader educational opportunities offered in the comprehensive American University with the goal of preparing them for a life-time of further learning rather than near-term professional practice.”
- * **Engineering for a Changing World (Duderstadt)**



NSB (2008) Key Challenges



- Respond to Changing Global Context
- Improve Public perception of engineering
- Retention of engineering students

Keystone Recommendation:

NSF should expand efforts to stimulate innovation in engineering education.



Educating the Engineer of 2020*



- Guiding Strategies
 - ✓ Engage in a comprehensive effort
 - ✓ Consider linkages
 - ✓ Focus on levers of change
 - ✓ Pursue student-centered education

*National Academy of Engineering



(13) 2020 Recommendations



- 4) “Whatever other creative approaches are taken in the four year engineering curriculum, –the essence of engineering- the iterative process of designing predicting performance , building and testing should be taught from the earliest stages of the curriculum, including the first year.”

- 1) B.S. degree should be “pre-engineering” degree or Bachelor of Arts in engineering



Eng Ed and Workforce WG Basic Question?

**What are our Goals and
are we getting there?**

(And where does NSF fit in?)





Challenges, Recommendations and Goals: Current Status

Challenges XXXXXXXXXXXXXXXXX

Recommendations XXXXXXXXXXXXX

Goals X





Eng Ed and Workforce WG: Possible (NSF?) Eng Ed Goals

- Provide nation with an engineering workforce for engine of economic growth
 - Assure Eng graduates lead fulfilling professional lives
- Assure NSF Eng Ed annual investment of 200 mil is well directed and assessed
- Educate nation about the importance of engineering in our daily lives
- Improve the quality and relevance of engineering education





Potential NSF Projects

- “Business as Usual and Not” Projects
 - (A) Pathway Monitoring
 - (B) Community Colleges/Alternatives
 - (C) Undergraduate
 - (D) Graduate/Faculty
- Feedback project (“How is Business?”)
 - (E) Engineering Workforce



(A) Pathway Monitoring (BAU)

Partnership with SAT/ACT

(2.5 mil students annually indicate a major)

(B) Community College/ Alternative Pathways (BAU)

4) GI Bill/Engineering College opportunity

(9/11 GI Bill and the “technical soldier”)



(C) Undergraduate (non BAU)

- a) Workshops/Grants for BA/BS Curricula
- b) Architecture, Environment, Urban planning opportunities

(D) Graduate (non BAU)

Investment in Innovation

- a) Industry-focused Supplements for 800 Eng GRF



(E) Workforce (non BAU)

9) Survey U.S. engineering workforce to ascertain levels of satisfaction and career paths (\$)

- 1.5 million engineers in the U.S.
- BLS annual growth rate at 1% for next decade
- Engineers who leave—why?
- 80k median salary (2008)
- Mobility of 1960s lower/middle class?



Engineering Graduate



**Engineer
(Success!)**



**Other pathways in Life
(Also Success?)**