Beyond 2020: Preparing Engineers for the Future

Sarah A. Rajala
Dean and Professor
Earnest W. & Mary Ann Deavenport, Jr. Chair
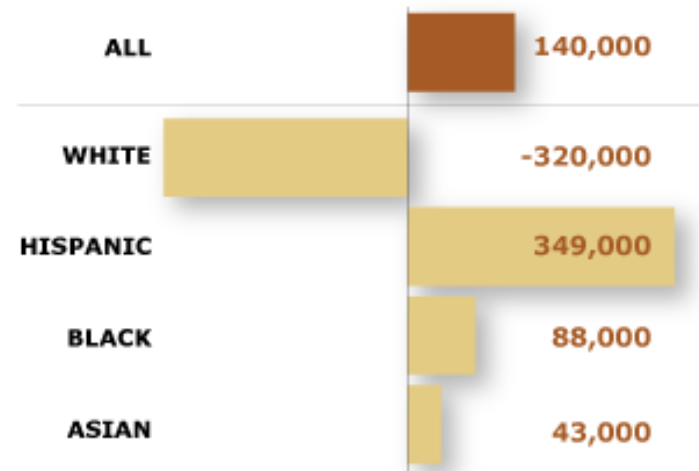Past President, American Society for Engineering Education
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Changing Conditions

- Changing U.S. demographics
  - Increase in diversity
  - Increase in first-generation
  - Increase in non-traditional
  - Increase in returners

Change in 18- to 24-Year-Old College Enrollment, 2009 to 2010

ALL	140,000
WHITE	-320,000
HISPANIC	349,000
BLACK	88,000
ASIAN	43,000

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Current Conditions

- Science and engineering bachelor's degrees
  - Women earn ~50% of the bachelor's degrees in S&E
  - Women earn ~18% of the bachelor's degrees in engineering and computer science
  - African Americans and Hispanic Americans each earn ~8% of the bachelor's degrees in S&E
  - Native Americans earn less than 1% of the bachelor's degrees in S&E
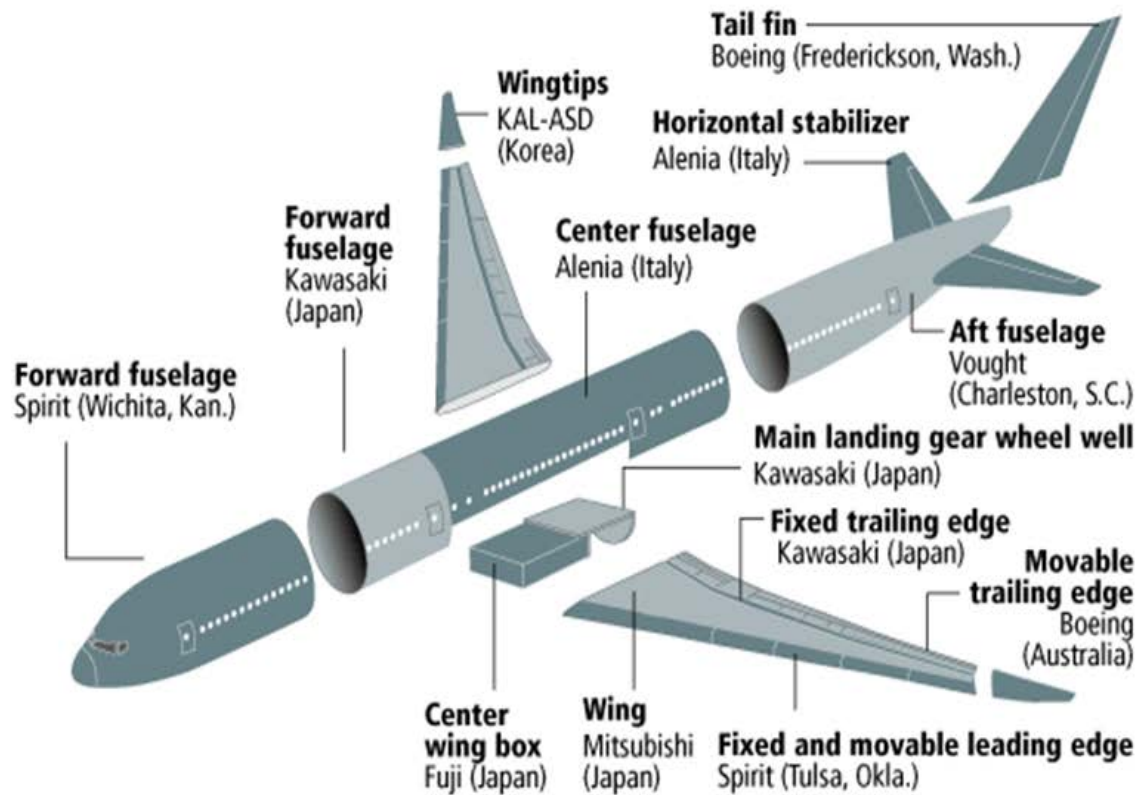
Changing Conditions

- Globalization of Engineering
  - Impact of the advances in telecommunications and other enabling technologies
  - Political events that opened previously closed societies
  - Adoption of economic policies which promote free trade
  - Expansion of multi-national corporations

Boeing 787 Dreamliner

Why Change?

- Economic imperative
- Attract the best, brightest and most diverse talent to engineering
- Enhance creativity and innovation

Change is really not an option

"Engineers are packaged as problem solvers rather than creators and innovators addressing grand challenges,"
Jacquelyn F. Sullivan, University of Colorado

What Do We Do?

"We have to ask basic questions about future engineers - who they will be, what they will do, where they will do it, why they will do it, and what this implies for engineering education in the United States and elsewhere."

Charles Vest, NAE

Attributes of a Global Engineer

Competencies

- Engineering science fundamentals
- Technical discipline
- Design and manufacturing process
- Project management
- **Global markets and business practices**
- **Complex, multidisciplinary systems**
- *Systems approach to engineering*
- **Political contexts**
- Ethical, safety and **security** standards

Attributes of a Global Engineer

Competencies

- Effective communication
- **Language(s) other than one's native language**
- Curiosity and desire to learn for life
- **Flexibility**
- Ability to think critically and **creatively**
- **Cultural** and social awareness
- Leadership, as well as the ability to work on **diverse teams**
- Entrepreneurship
- **Mobility**

Strategies for Success

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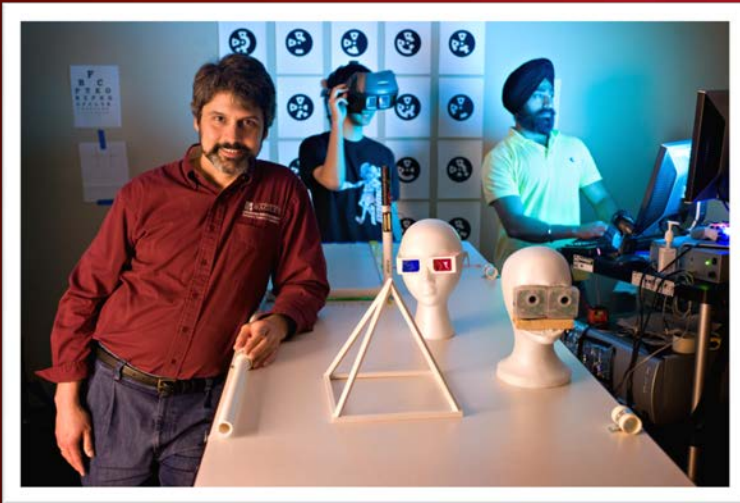
- Start over – e.g. Olin College
- Educate the whole person – multiple intelligences
- Focus on learning not teaching
- Make effective use of technology – smart phones, tablets, social networking
- Think differently about who we admit and who we hire

Strategies for Success
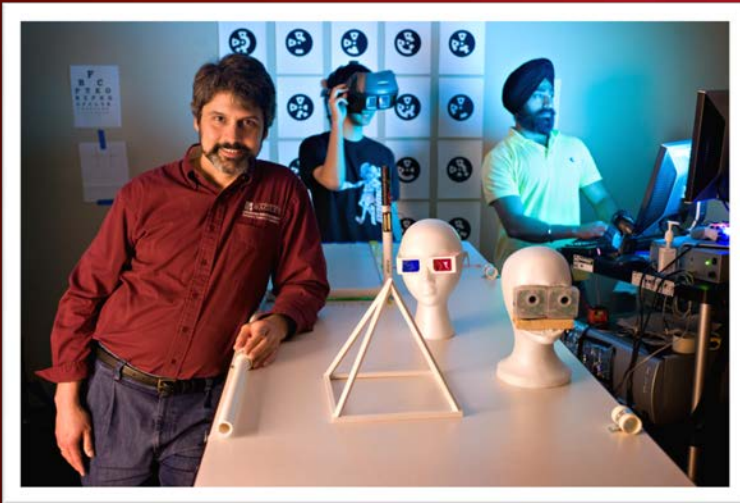
- From a global perspective
  - Double major or dual degree programs, minor or certificates
  - International co-ops or internships
  - International projects
  - Study abroad or academic exchanges
  - Collaborative research and design projects
  - Service learning projects abroad

A Future of Opportunity

"As we think about the challenges ahead, it is important to remember that students are driven by passion, curiosity, engagement and dreams. Although we cannot know exactly what should be taught, we can focus on the environment in which they learn and the forces, ideas, inspirations and empowering situations to which they are exposed."

Charles Vest, NAE

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Thank you!!

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