

What are the Essential Attributes for Engineers to Successfully Compete in a Global Context?

Catherine Didion

National Academy of Engineering

ASEE Corporate Member Council

Special Interest Group (SIG) on
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International Engineering Education Special Interest Group

Initial Effort:

- Develop and present an assessment of the skills and experiences required by engineering graduates to work effectively in a global environment.
- Goal – enhance the employability of engineering graduates and increase the international competitiveness of ASEE's members.
- Translated in several languages & list of attributes narrowed from 50 to 20.
- Survey ~ 1000; 50% U.S. & 50% Europe, Asia, & Latin America; 80% male & 20% female; 46% academia & 42% industry.



Key Findings

All attributes were deemed to be either “extremely important” or “important.”*

- Scale:
 - » 1 = “extremely important”
 - » 2 = “important”
 - » 3 = “slightly important”
 - » 4 = “not important”
- Means ranged from 1.288 to 2.331. 17 of 20 means below 2.0
- For most attributes a “stair-stepping” of both importance levels and proficiency levels occur over time.
- What can be eliminated? This is a key challenge.

*As ranked at the tertiary and early-professional level.



Areas of Convergence & Divergence

Professionals think these attributes are less important upon graduation from a tertiary school than academicians:

- Possesses an international/global perspective.
- Possesses fluency in at least two languages.
- Functions effectively on a team.
- Embraces a commitment to quality principles/standards and continuous improvement.
- Embraces an interdisciplinary/multidisciplinary perspective.
- Mentors or helps others accomplish goals/tasks.

Question to ponder: Why do academicians think these attributes are slightly more important than professionals? Do professionals anticipate their own training of newly hired?



Areas of Convergence & Divergence

Overwhelmingly, academicians and professionals agree that it is important to extremely important for graduates of tertiary schools to have at least intermediate proficiency in these attributes:

- **Shows initiative and demonstrates a willingness to learn.**
- **Demonstrates an understanding of engineering, science and mathematics fundamentals.**

Generally, however, professionals think the proficiency-level of several attributes to be less advanced upon graduation from a tertiary school than the academicians.

Academicians think many attributes are both more important and greater proficiency is needed than do professionals. Raises depth versus breadth issues.



Areas of Convergence & Divergence

8 of the 20 attributes professionals think are less important for early-career engineering professionals than the academicians:

- Demonstrates an understanding of project planning, management, and the impacts of projects on various stakeholder groups.
- Demonstrates an understanding of stages/phases of product lifecycle.
- Demonstrates an understanding of political, social and economic perspectives.
- Possesses an international/global perspective.
- Possesses fluency in at least two languages.
- Embraces a commitment to quality principles/standards and continuous improvement.
- Applies personal and professional judgment in effectively making decisions and managing risks.
- Mentors or helps others accomplish goals/tasks.



Low Ranking of “Global” Attributes

Question to ponder: Why are most of the ‘globally-oriented’ attributes ranking at the bottom of the list?

- **Demonstrates an understanding of political, social and economic perspectives.**
- **Possesses an international/global perspective.**
- **Possesses fluency in at least two languages.**



Bottom Line: Key Take-Away Items

Attributes were developed through intensive stakeholder-driven process and survey translated and deployed in a global roll-out through intentional, representative distribution channels.

Work-in-progress findings highlight:

- The validation of all attributes as being important
- Consistent agreement on key attributes' importance and proficiency levels
- Differences between importance/proficiency on some attributes, with professionals tending to feel attributes less important/less proficient than academicians
- Survey closed in September 2011 and more analysis to occur

Goal is to move from the “what” and “why” to the “how”

- How do we collectively introduce, reinforce, assess, improve, scale, and sustain these attributes at secondary/high school, tertiary/college/university, and early-career professional levels



Conclusion of Surveys

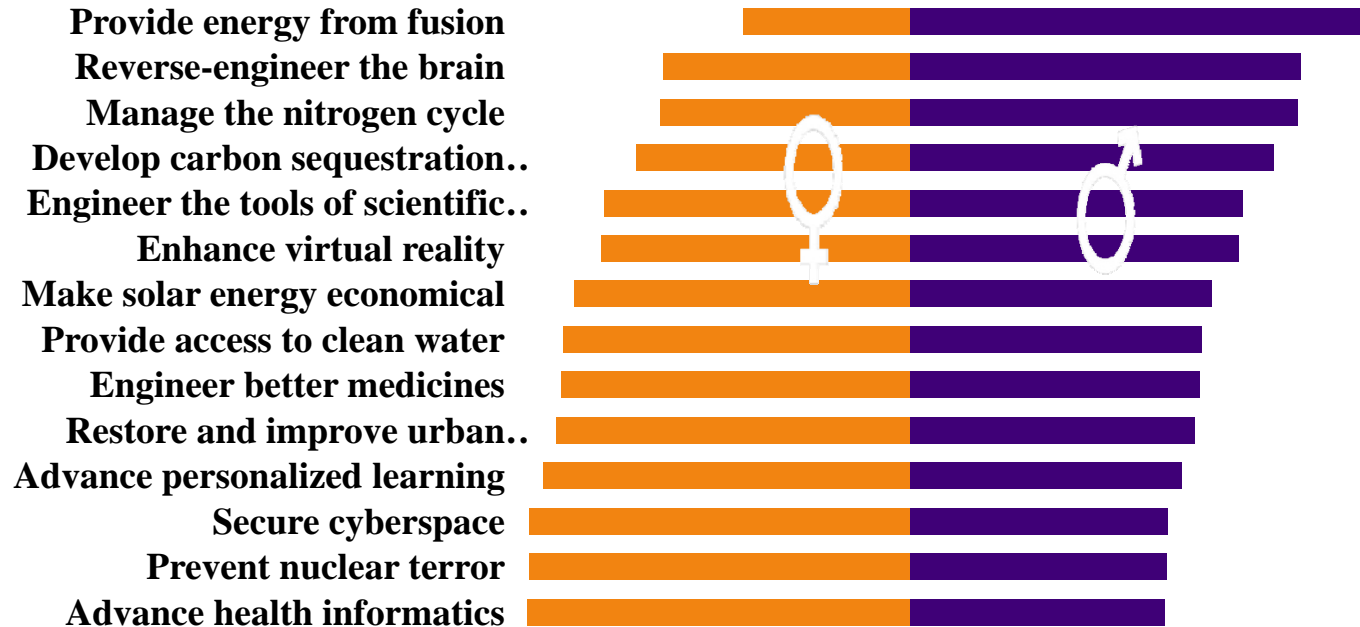
- **Academics tend to overvalue the importance of proficiencies of most attributes relative to their professional colleagues.**
- **Almost all attributes showed a “stair-stepping” of proficiency and importance with time.**
- **The attributes most associated with a “global” context were not as highly rated. Echoes Jamieson & Lohmann 2011 report that 43% of faculty surveyed stated that international programs were “somewhat practiced” and “somewhat important.”**



Context is Key for Reaching Many Audiences



Ranking of perceived importance of the challenges among women and men



When extrapolated to equal male/female populations, the resulting ranking of challenges in a top three selection of importance shows the nature of the gender gap. At one end, 74% of the votes for “providing energy from fusion” come from men, the rest from women. At the other end, “advanced health informatics” receives 60% of its score from women and 40% from male. The perception of importance of the challenges is indeed gender sensitive.

Source: *Challenges for Engineering: Eyes of the 21st Century Students* by Dassault Systems

Intentions of freshmen to major in Engineering, By race/ethnicity and sex, 2008

