Global Engineering Competency: Defining, Developing, and Assessing

Global E3 / AE3 Meeting
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Brent K. Jesiek, Ph.D.
School of Engineering Education
School of Electrical and Computer Engineering
Purdue University, West Lafayette, IN USA
bjesiek@purdue.edu

Global Engineering Competency Activity

**Scenario:** Imagine you are an engineer working for a multinational corporation that is expanding operations in both South America and Southeast Asia. You are involved in evaluating the feasibility of the expansion, including finding suitable locations and planning operations. How prepared are you to enter this work situation? What knowledge and capabilities do you have and what do you lack?

**Task:** List and briefly describe five (5) competencies (knowledge, skills, and/or attitudes) you think would be most needed to complete this work assignment.
What is Global Competency?

Possess the knowledge, ability, and predisposition to work effectively with people who define and solve problems differently than they do.

Understand how national differences are important in engineering work.


International Research and Education in Engineering (IREE): Developing Globally Competent Engineering Researchers

Co-PIs: E. Daniel Hinkleman, Brant K. Jesiek, and Eckhard Groll, with support from Yating Chang and Yi Shen

Program Objectives
- Leverage international partnerships to enhance education and research innovations in U.S.
- Enhance global competency of future U.S. engineers and engineering researchers
- Set stage for future scale-up, including by systematically studying aspects of program

Participant Summary
- 360 applications, 278 complete
- 58 IREE awardees selected
- 21 site- and 37 self-placement
- 27 (46%) women, 26 (45%) ugrad
- 40+ U.S. schools represented
- Diverse host sites, including:
  - Tsinghua University
  - Shanghai Jiao Tong University
  - Xi'an Jiaotong University
  - Tianjin University
  - Peking Union Hospital
  - Microsoft Research Asia
  - Time Medical
  - Intel
Global Engineering Experience

Traditional Orientation + ... + Immersive Global Experiences = Transformative Global Engineering Experience

- Language
- History
- Cultural Etiquette

- Study
- Research
- Intern
- Work

Transformative Global Engineering Experience

Traditional Orientation + Global Engineering Orientation + Immersive Global Experiences = Transformative Global Engineering Experience

- Language
- History
- Cultural Etiquette

- Engineering Cultures
- Participant Observation Strategies

- Study
- Research
- Intern
- Work
The Janus Face of Culture

Within a culture, people are similar.

Even within a culture, people are different.

Positives
- Easy to learn and remember images
- Allows us to use patterned responses tuned to images

Negatives
- Oversimplifies
- May blind us to exceptions
- Sometimes difficult to detect changing dominant images

Positives
- A much more realistic outlook
- Encourages us to focus on individuals rather than groups

Negatives
- Complexity can be overwhelming
- Individual actions difficult to interpret
- Optimal responses not always clear

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Engineering Cultures® Learning Modules

Now Available
- Britain
- France
- Germany
- Japan
- Russia/USSR
- United States

Under Development
- China
- Canada
- Australia
- India
- Brazil
- Korea
- Mexico
- Colombia

For more information, visit: https://globalhub.org/resources/11
IREE 2010 China: Comprehensive Research and Evaluation Framework

<table>
<thead>
<tr>
<th></th>
<th>Pre-Assess 1 (prior to orientation)</th>
<th>Pre-Assess 2 (during orientation)</th>
<th>Post-Assess 3 (at or after re-entry meeting)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Background demographic survey</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Readiness assessment</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) Diversity survey (MGJDS-5)</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d) Global competency assessment</td>
<td>✓</td>
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<tr>
<td>(e) Reflective exercises, assignments</td>
<td>✓</td>
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<tr>
<td>(f) Survey evaluation of orientation</td>
<td>✓</td>
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<tr>
<td>(g) Participant interviews, focus groups</td>
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<tr>
<td>(h) Survey evaluation of full program</td>
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<tr>
<td>(i) Survey of hosts and sponsors</td>
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</tbody>
</table>

Readiness Assessment V2

Readiness Assessment

Last four digits of your cell phone number: __________ (only used for tracking survey data/results)

Please evaluate each statement listed below:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree a little bit</th>
<th>Agree a little bit</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I am anxious about going abroad.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. If I need help while abroad, I will know who to contact.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3. While abroad, I know how to keep in touch with my family.</td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>4. I am prepared to go abroad.</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>5. I question if going abroad was a good decision.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Factors
- Knowledge and Readiness
- Doubt
- Perception of Benefits
- Anxiety

19. I am ready to read. [ ] [ ] [ ] [ ] [ ]
20. I have enough reasons for deciding to go abroad. [ ] [ ] [ ] [ ] [ ]

6
MGUDS-S: Measuring UDO

Miville-Guzman Universality-Diversity Scale – Short Form (MGUDS-S)

- Designed to measure universal-diverse orientation (UDO), or "an attitude of awareness and acceptance of both similarities and differences that exist among people" (Miville et al., 1999).
- 15-item short form (Fuertes, et al., 2000) with three subscales to examine cognitive, behavioral, and affective dimensions of UDO:
  1. seeking *diversity of contact* with others
  2. having *relativistic appreciation* of oneself and others
  3. degree of emotional *comfort with differences*


<table>
<thead>
<tr>
<th>Item</th>
<th>1 Strongly Disagree</th>
<th>2 Disagree</th>
<th>3 Disagree a little bit</th>
<th>4 Agree a little bit</th>
<th>5 Agree</th>
<th>6 Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I would like to join an organization that emphasizes getting to know people from different countries.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. Persons with disabilities can teach me things I could not learn elsewhere.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. Getting to know someone of another race is generally an uncomfortable experience for me.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4. I would like to go to dances that feature music from other countries.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. I can best understand someone after I get to know how he/she is both similar and different from me.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6. I am only at ease with people of my race.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>7. I often listen to music of other cultures.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>8. Knowing how a person differs from me greatly enhances our friendship.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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</tbody>
</table>
MGUDS-S Results

Figure 1. Group Comparisons of Total MGUDS-S Scores


MGUDS-S Results

Mean MGUDS-S Total Scores, Pre/Post-REE, by Gender

Estimated Marginal Means of Total MGUDS-S Scores

Gender
male
female

CulturalOutlook
Pre-REE
Post-REE

Global Engineering Competency Activity

Scenario 2: As an employee in a large multinational corporation, you are temporarily assigned to your company’s branch operations in Shanghai, China. Your work team consists of three Chinese engineers, all at about the same rank as you. Your team reports to an engineering manager, who is also Chinese. In a recent team meeting, your manager presented a solution to a difficult quality control problem. However, you feel you feel the proposed solution will likely fail. How would you handle this situation, and why would you handle it this way?

Global Engineering Competency Activity

<table>
<thead>
<tr>
<th>Response Pre-IREE (May 2010)</th>
<th>Response Post-IREE (September 2010)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;I would first discuss my opinion with my other Chinese teammates (assuming we can communicate). If they agreed with my belief about the failure, then I would suggest we approach the manager as a team and confront him. If they disagreed, or suggested that it was a bad idea to confront the manager, I would still confront him especially if I felt certain that the product would fail. If the team command me otherwise, I would obviously not go through with it (as long as their reasoning was based on sound engineering/science).&quot;</td>
<td>&quot;Even though Chinese people (particularly those of high rank) are constantly concerned about ‘losing face’, I think issues of quality control need to be addressed upfront and to the point. I would definitely approach the manager one-on-one though, so that the issue is just between he and I.”</td>
</tr>
</tbody>
</table>

Response Level: 1 Response Level: 3
# Global Engineering Competency Activity

<table>
<thead>
<tr>
<th>Level / Description / Example</th>
</tr>
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<tbody>
<tr>
<td>0 Clear Evidence of Cultural Insensitivity or Inappropriateness</td>
</tr>
<tr>
<td>1 Cultural Sensitivity Unclear (Response is Neutral or Ambiguous)</td>
</tr>
<tr>
<td>2 Clear Evidence of Predisposition to Cultural Sensitivity (Not Context Specific)</td>
</tr>
<tr>
<td>3 Clear Evidence of Cultural Sensitivity, Including Awareness of Specific Context</td>
</tr>
</tbody>
</table>

"To be completely honest, I'd handle this problem exactly as I would in the USA. I'd make my thoughts known and express the reasoning behind my thought process. Should communication barriers arise, I would handle that in the "normal" fashion. Honestly, being in China changes nothing about how one handles engineering problems, in my opinion."  
(FYE Student)

"I would inform the team of my concern and address the concern and any potential solution with my team before speaking with the manager. I am ethically bound to address the problem even the [sic] doing so may be socially awkward."  
(FYE Student)

"I would prior to being assigned here read about Chinese culture then decide how I could inform him without offending anyone, due to the cultural differences."  
(FYE Student)

"I would meet with the manager privately, and discuss the situation with him. I wouldn't discuss it with the coworkers because I wouldn't want him to lose face. I would try to bring up the issue politely and pose it as a question. "Do you think it is possible that it might fall? Do you think that if we did XYZ it would have a higher probability of success, etc.?"  
(IRE Student)

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[Image and text from page 10 of the document:]

## IREE 2010 Outcomes

- Student Blogs
- Engineering Cultures® China
- Chinese History and Culture
- Publications and Presentations
- Trip Reports
- Photo Contest Entries

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[Website link: http://globalhub.org/eree]
CHAPTER 2

From Diplomacy and Development to Competitiveness and Globalization: Historical Perspectives on the Internationalization of Engineering Education

Brent K. Jesiek and Kacey Beddoes


Building Trust

by Roger Neil Reckamp

Purdue University

This picture was taken from inside the Oriental Pearl Tower in Shanghai. The floor was a thick sheet of glass. It symbolizes the fact that the global engineer must place a certain level of trust in his or her host culture in order to be successful.