Measuring the Impact of Global Preparedness and Competency in Students

Session V: Tracking the Outcomes of International Research Experiences

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Collaborative Research: Assessing the Spectrum of International Undergraduate Engineering Educational Experiences
My Task for the Next 18 Minutes

1. Explain the research our collaborative team is conducting
   • To measure the impact of global preparedness and competency in undergraduate engineering students

2. Determine how one might measure and track outcomes of international research experiences
   • Provide the framework for our approach

3. Determine a process and discuss available assessment tools
Task 1 –

Explain the research our collaborative team is conducting to measure the impact of global preparedness and competency in undergraduate engineering students.
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Cheryl Matherly, University of Tulsa
Gisele Ragusa, University of Southern California
Lisa Benson, Clemson University

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PhD Student, University of Pittsburgh
Our Research Focus:

To enhance engineering students’ global preparedness...

We must:

• Better **identify the various ways** that global preparedness can be developed both in and out of formal curricula

• Better understand how **each approach enhances students’ global awareness and preparedness**

we needed a framework to define and operationalize global preparedness and how this may be achieved
Need to measure global preparedness in engineers
- It’s expensive!
- Anecdotal methods

Research Focus
- Identify experiences
- Determine impact

Study 1 –
- Delphi study with SMEs
- Useable Framework

Study 2 –
- 4 school mixed methods study
- Specific experiences & contribution

Study 3 –
- Large 15 school study with single instrument
- Catalog impacts and accessible database
Study 2 – Mix Methods

- **Quantitative**
  - Survey instrument
    - Experiences
    - Background information
  - EGPI and GPI
  - Freshmen & seniors

- **Qualitative**
  - Individuals who scored high on one or both instruments
  - On-on-one interviews

Refined – Theoretical Framework

- Personality Traits
  - Risk seeking & taking
  - Intellectual curiosity

- Pre-existing knowledge
  - Inquiry
  - Trait- and state-like
  - Intellectual curiosity

- Maintained curiosity
  - Drive
  - Guiding emotions

- Changes in Behavior
  - Out of social comfort zone

- Change in Cognition and attitude
  - Cognitive
  - Dissonance
  - Attitude change
  - Self-efficacy
  - Self-esteem
  - Confidence
  - Resilience
  - Study 1 framework

Adapting Prochaska & DiClemente’s Trans-theoretical Model of Change

Jackson et al. 1972 Social Risk Taking
Study 3 – Cross-Institutional

- Instrument
  - 7 background
  - 3 educational
  - 35 GPI
  - 3 international
  - 7 international/intercultural experience
- 7-9 minutes to complete
- Currently 13 U.S. engineering schools & potentially 17
Task 2 –

Determine how one might measure and track outcomes of international research experiences

START WITH THE END IN MIND
Theoretical Framework

Context Factors
- Engr in Context
- Culture in Context

Precursor Theories
- Social Cognitive
- Social Cultural Theory

Mediating Experiences
- Formal & Informal Pedagogical Practices
- Engineering Ability
- Global competency
- Professional practice and application

"Maturation"
- Engineering Global Preparedness

Exogenous & Personal Factors
Study 1 - Delphi Study

...reach consensus about **constructs** of engineering global preparedness and essential **components** of learning experiences to obtain preparedness.
Conceptual Model

International Contextual Knowledge

- Understanding of the political and economic constraints for research and development, manufacturing, import/export, and sales in different countries
- International professionalism and ability to articulate global engineering practices in context
- Knowledge of world geography
- World view and understanding impacts of global connectivity
- Knowledge of the history of engineering in various regions of the world
- Ability to understand global markets, business, politics, and trade

Engineering Global Preparedness

- Foundational knowledge in engineering, science, and mathematics fundamentals
- Understanding of differences in engineering ethical standards/expectations across countries and cultures
- Understanding of technical business practices as related to engineering
- Ability to engage in problem solving involving scientific knowledge from multiple disciplines
- Ability to understand how their career as impacted by global engineering practices
- Awareness of local, regional, and international differences in technical standards and regulations

Cross-Cultural Communication Skills & Strategies

- Proficiency in another language
- Awareness of diversity within and across cultures as related to defining and solving engineering problems
- Ability to work effectively as a leader or member of a cross-cultural engineering team
- Ability to interact with engineers and others from different cultures
- Language proficiency sufficient to complete technical tasks, presentations and communication

Personal & Professional Qualities

- Intellectual curiosity
- Open, positive attitude
- Integrity
- Self-efficacy / Can-do attitude
- Ability to think in an integrated, interdisciplinary manner
- Understanding how to effectively transmit information in a manner appropriate for diverse professional audiences
- Mental agility
- Flexibility and adaptability
- Creativity and innovation
- Ongoing, voluntary self-motivated learner
Attributes of Preparedness

- Foundational knowledge
- Differences in engineering ethical standards/expectations
- Use technology
- Technical business practices
- Career is impacted by global engineering

- Engage in problem solving
- Awareness of local, regional and international differences in technical standards and regulations

Readiness to engage and effectively operate under uncertainty in different cultural aspects and address engineering problems
Task 3 –

Determine a process and discuss available assessment tools
Start with the end in mind...

- Determine measurable outcomes, attributes, and objectives
- Then determine the instrument that best meets
- Darla Deardorff
  - The SAGE Handbook of Intercultural Competence
  - “Tools” – Assessment instruments

- Head spin time...
<table>
<thead>
<tr>
<th>Area Measured</th>
<th>Instrument</th>
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<tbody>
<tr>
<td>Intercultural competence</td>
<td>INCA project</td>
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<td>Self-assessed cross-cultural competence</td>
<td>TMS</td>
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<td>Cross-cultural competence</td>
<td>EP</td>
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<td>CCSAQ</td>
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<td>AIC</td>
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<td>Intercultural sensitivity</td>
<td>ICSI</td>
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<td>Cross cultural sensitivity</td>
<td>CCSS</td>
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<td>Individual global perspective</td>
<td>GPI</td>
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<td>EGPI</td>
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<td>Global literacy</td>
<td>Intercultural competence questionnaire</td>
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<td>World knowledge</td>
<td>GAP</td>
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<td>Global literacy survey</td>
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<td>Intercultural skills</td>
<td>ILWI</td>
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<td>IRC</td>
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<td>Personality analysis</td>
<td>IOR</td>
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<td>ICE</td>
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<td>Global teams</td>
<td>GTPQ</td>
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<td>GlobalSmart</td>
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<td>TMS</td>
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<td>Multicultural counseling competencies</td>
<td>MCI</td>
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<td>Cross-cultural counseling aspects</td>
<td>Cross-cultural counseling inventory</td>
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<td>Unconscious prejudices</td>
<td>Tests for Hidden Bias</td>
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<td>Orientation to cultural differences</td>
<td>IDI</td>
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<td>Cross-cultural awareness and effectiveness</td>
<td>PCAT/PCSI</td>
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<td>Compatible cross-cultural values orientation</td>
<td>SVS</td>
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<td>Individual understanding of self and others</td>
<td>CCA</td>
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<td>Effects of study abroad on student global mindedness</td>
<td>GMS</td>
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<td>Communication quality and accuracy</td>
<td>Development Communication Index</td>
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<td>Language proficiency</td>
<td>BASIC</td>
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<td>ASLPR</td>
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<td>ALD</td>
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<td>AIC</td>
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<td>ACTFL Proficiency Scale</td>
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<td>Cultural preferences</td>
<td>COI</td>
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<td>Personal disposition toward transformational</td>
<td>BEVI</td>
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<td>experiences</td>
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Caveat – groupings are based on my convenience!
Knowing desired attributes is a critical first step

Determine why you need to measure

Other factors
  • Reliability and validity
    • Comparison with others
  • How will it be used
    • Formative or summative

Develop only where necessary

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<tr>
<td>Potential success for an international assignment</td>
<td>IAP</td>
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<tr>
<td>Readiness for international work</td>
<td>IMA</td>
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<td>Cross-cultural adjustment</td>
<td>Living and Working Overseas Inventory</td>
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<td>Cross-cultural employee performance</td>
<td>OJQ</td>
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<td>Cross-cultural workplace adaptation</td>
<td>OAI</td>
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<td>POI</td>
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<td>FAST</td>
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<td>Culture in the Workplace Questionnaire</td>
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<td>CCAI</td>
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Our “old” IGERT

Sustainability and Engineering
• Research semester in Brazil
• Course in Brazil culture
• Portuguese language training

Evaluation
• Goal – value of the international experience
  • Self
  • Research
• Pre and post departure
  • IDI
• Focus groups post departure
  • On experiences abroad
  • Integration of research across international boundaries
Current Work - Global Perspectives Inventory

Larry Braskamp and colleagues

- Covered many attributes of interest
  - Quantitative modeling
  - Concise
  - Validity & reliability

- Useful to our study
  - Quantitative modeling

- Perspective of measure
  - Individual global perspective
  - Not evaluating the student

- Many schools interested in its use

<table>
<thead>
<tr>
<th>COGNITIVE</th>
<th>KNOWING</th>
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<tbody>
<tr>
<td></td>
<td>Degree of complexity of one’s view of the importance of cultural context in judging what is important to know and value</td>
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<tr>
<td>KNOWLEDGE</td>
<td>Degree of understanding and awareness of various cultures and their impact on our global society and level of proficiency in more than one language</td>
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<tr>
<td>INTRA-PERSONAL</td>
<td>IDENTITY</td>
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<td></td>
<td>Level of awareness of one’s unique identity and degree of acceptance of one’s ethnic, racial, and gender dimensions of one’s identity</td>
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<tr>
<td>AFFECT</td>
<td>Level of respect for and acceptance of cultural perspectives different from one’s own and degree of emotional confidence when living in complex situations, which reflects an “emotional intelligence” that is important in one’s processing encounters with other cultures</td>
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<tr>
<td>INTER-PERSONAL</td>
<td>SOCIAL RESPONSIBILITY</td>
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<td>Level of interdependence and social concern for others</td>
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<tr>
<td>SOCIAL INTERACTION</td>
<td>Degree of engagement with others who are different from oneself and degree of cultural sensitivity in living in pluralistic settings</td>
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More questions than answers

• What should we ask?
  • What are the desired outcomes or attributes of the student?, of the program?
  • What is the impact we want to measure?
• Where and when in the program?
  • Formative versus summative
• Are there models to adapt or adopt that we can leverage our work?