

Work in Progress: Exploring Intercultural Wonderment as a Mediator for Global Perspective Development in Engineering Students

Mr. John Austin Schneider, Rowan University

John Schneider graduated from Rowan University in 2017 with a Bachelor's degree in Chemical Engineering. He is currently pursuing his Master's degree in Engineering Management at Rowan University. He is working under Dr. Scott Streiner in researching international engineering education. Specifically, his work is focused on "intercultural wonderment" and its relationship to global competency in engineering undergraduates.

Dr. Scott Streiner, Rowan University

Dr. Scott Streiner is an assistant professor in the Experiential Engineering Education Department (ExEEd) at Rowan University. He received his Ph.D in Industrial Engineering from the University of Pittsburgh, with a focus in engineering education. His research interests include engineering global competency, curricula and assessment; pedagogical innovations through game-based and playful learning; spatial skills development and engineering ethics education. His funded research explores the nature of global competency development by assessing how international experiences improve the global perspectives of engineering students. Dr. Streiner has published papers and given presentations in global engineering education at several national conferences. Scott is an active member in the Center for the Integration of Research, Teaching, and Learning (CIRTL) both locally and nationally, as well as the American Society for Engineering Education (ASEE) and the Institute of Industrial and Systems Engineers (IISE).

Introduction

Our world is becoming more globally driven as technology and markets expand and evolve. This makes working with other cultures now an inherent and daily task that individuals will face. Engineers will interact and communicate not only with various professional disciplines, but also with differing degrees of culture. It is critical that our engineering undergraduate students develop the knowledge, skills, and attitudes necessary to work across cultural boundaries and to effectively adapt, integrate, and communicate in new environments. With this comes the need for educators to begin to develop educational systems and practices that help students cross these boundaries [1, 2].

There is a growing recognition of the importance to implement and engage students in higher education in purposeful environments (i.e. study abroad, service experiences, domestic activities) that would allow them to develop global perspectives and cross-cultural skills to help them effectively adapt to the diverse world market [3, 4, 5, 6, 7]. There exist various instruments and scales that aim to measure global perspectives and cross-cultural skills such as the Intercultural Development Inventory (IDI) [8], Miville Guzman Universality Diversity Scale (MGUD-S) [9], and the Engineering Global Preparedness Index (EGPI) [10]. The global perspectives of engineering students in this study was measured via the Global Perspective Inventory (GPI) [11]. This instrument was used because it closely aligns with global perspective constructs the study aims to measure. The GPI is also a validated instrument and widely used for a basis for comparison against non-engineers. Additionally, a number of studies have used the GPI to examine the impact of study abroad experiences with consistent results and strong statistical reliability and validity [11, 12, 13].

Given the expansion of international experience types and engineering student participation [7], it's critical to determine the broader mechanisms that foster global learning and perspective development. It is by analyzing global perspective levels there exists a potential to investigate how authentic, cultural interactions can promote global mindsets within international experiences to foster *intercultural wonderment*. This is a process that “encapsulates the underlying curiosity in individuals to seek out new and different experiences while studying abroad and involves a willingness and capacity to deal with discomfort and disequilibrium” [13].

This work-in-progress study examines how intercultural wonderment is manifested through international experiences (i.e. study abroad, recreational travel, domestic experiences) in which engineering students typically engage. Specifically, this mixed-methods study draws upon undergraduate engineering student interview data which focuses on themes such as motivations to pursue international experiences, impact of said experiences on their perceptions of engineering, and the cultural relevance of engineering in general. It also explored the personally relevant aspects of their experience. Interviews were then analyzed to investigate global learning outcomes from the experience as well as aspects of intercultural wonderment. Thus, this study aims to answer following research questions:

1. How is intercultural wonderment manifested through international experiences?
 - a. Which types of international experiences facilitate intercultural wonderment?
2. How does intercultural wonderment relate to global perspective development in engineering students?

Theoretical Framework

What are Global Perspectives?

Researchers have used a variety of terminologies and definitions to characterize the concept of cross-cultural skills and global mindset development, including global competency [14, 15], intercultural competency [16, 17, 18], global perspective [11], and cultural intelligence [19]. One of the most common models, and a basis for other cultural models, is Bennett's Development Model of Intercultural Sensitivity (DMIS), which generates a continuum that classifies individuals based on ethnocentric and ethnorelative perspectives [20]. Here, ethnocentric perspectives have an individual evaluate other cultures in relation to their own, whereas, ethnorelative the individual can see many values and behaviors as cultural rather than universal. IDI was an instrument developed to measure this continuum [8, 21]. MGUD-S has been used to determine an individual's level of awareness and acceptance for similarities and differences that exist between cultures [9]. The EGPI provides an index that analyzes how prepared students are for the global workforce and has previously been used within engineering [10]. The GPI measures global and holistic student learning and development through student experiences and perceptions of their campus environment [11]. It adopts a scale that rates individuals in the areas of interpersonal, intrapersonal, and cognitive seeking to answer the questions of "How do I relate?," "Who am I?," and "What do I know?" (Figure 1).

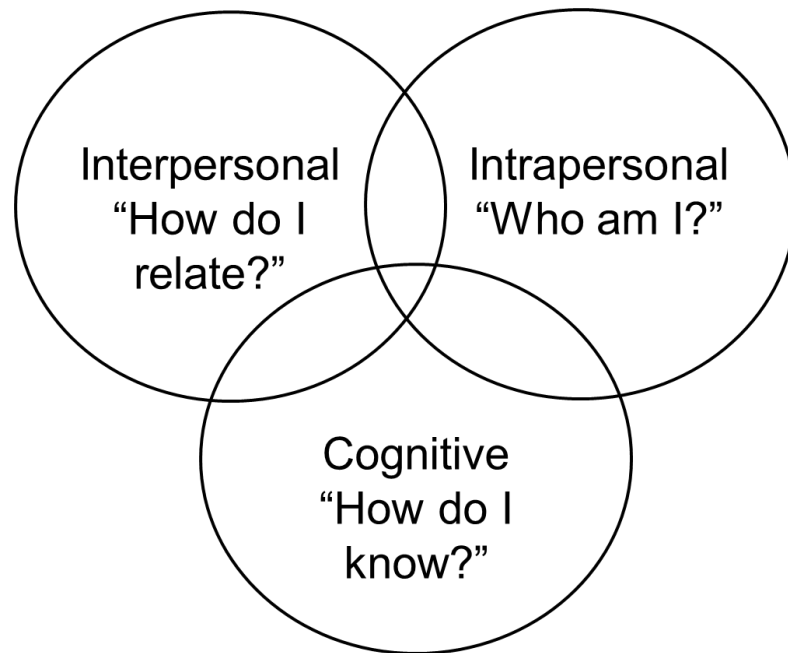


Figure 1. Conceptual depiction and composition of the GPI

Each dimension is further broken down into two subscales to better analyze individual learning and perception. These three dimensions and their respective subscales can be seen in Table 1.

Table 1. GPI categories and subscales [1]

Interpersonal	
Social responsibility ($\alpha = 0.73$)	The level of interdependence and social concern for others
Social Interaction ($\alpha = 0.70$)	The degree of engagement with others who are different from oneself and degree of cultural sensitivity when living in pluralistic settings
Intrapersonal	
Identity ($\alpha = 0.74$)	Combination of the level of awareness of one's unique identity and degree of acceptance of one's ethnic, racial, and gender dimensions of that identity
Affect ($\alpha = 0.73$)	The level of respect for and acceptance of cultural perspective different from one's and

	degree of emotional confidence when living in complex situations
Cognitive	
Knowing ($\alpha = 0.66$)	Degree of complexity of one's view of the importance of cultural context in judging what to know and value
Knowledge ($\alpha = 0.77$)	Degree of understanding and awareness of various cultures and their impact on global society

Cronbach's alpha (α) is an estimate of the reliability of a test's scores and score interpretation [22].

Intercultural Wonderment

Often, individual learning is generated from curiosity and meaningful experiences, which can shape personal development and perspectives. Particularly when students engage in an international experience, it is their underlying curiosity to seek out new experiences and ability to deal with the discomfort and disequilibrium where students may encounter the process of *intercultural wonderment*. Intercultural wonderment itself was based around the theories and literature of mindful wonderment [23], mindfulness [24], cognitive disequilibrium spawned through encounters with difference [25], self-authorship and meaning making [26], and intercultural maturity [27]. During a longitudinal study, Engberg and Jourian (2015) assessed process-related variables, such as intercultural wonderment, on students who were studying abroad both pre- and post-departure. Reliability analysis and factor loadings were performed in relation to GPI for intercultural wonderment ($\alpha = .724$) [13]. When identifying if intercultural wonderment is evident in students, the four questions were addressed:

1. "How often does a student intentionally push themselves out of their comfort zone?"
2. "How immersed is the student in the culture?"
3. "Does the student attempt new habits and behaviors?"
4. "Does the student engage with community individuals not from the classroom?"

These questions relate to the four areas Engberg and Jourian (2015) define as intercultural wonderment: comfort zone, immersion, habits and behaviors, and interaction [13]. However, some students conveyed valuable experiences that were not thought to fall under any of the aforementioned areas of intercultural wonderment. For this reason, and for the study to fully encapsulate all the meaningful experiences of the students, the area of *culture shock* was included by the authors under the concept of intercultural wonderment. Understanding these experiences and how intercultural wonderment influences engineering students' global perspectives can assist in designing international experiences that foster high quality and meaningful interactions that foster strong cross-cultural skills.

Ultimately, Engberg, Jourian and Davidson (2016) describe intercultural wonderment to provide a crucial intermediary step in connecting an international experience's design and the global learning outcomes these experiences claim to address through their framework shown in Figure 2 [28]. One of these benefits includes positive significant impacts on the development of a student's GPI scores [11, 28]. Educators and universities can begin to understand how programmatic components, such as the international experience type, for engineering students can foster intercultural wonderment in efforts to improve the students' global perspectives and global learning outcomes.

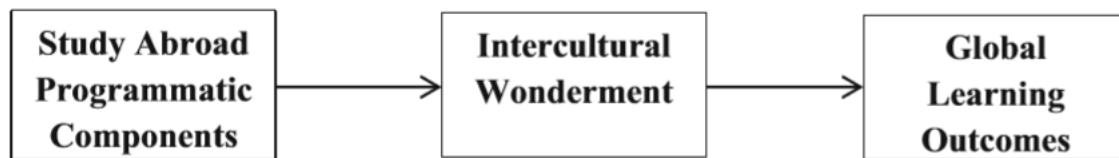


Figure 2. Conceptual framework conveying the intermediary role of intercultural wonderment [11]

Proposed Methods

A participatory and mixed-methods approach that utilizes qualitative comparative analysis (QCA) is being used under a National Science Foundation (NSF) funded research grant for the four U.S. universities (NSF EEC-1160404). Appropriate human subject training and IRB approval was obtained for the study under IRB #PRO16020008.

Data Collection and Participants

Data for the study was collected both qualitatively and quantitatively through a Qualtrics survey sent out via email to engineering students and one-on-one interviews for students who indicated an international experience (i.e. study abroad) within the survey. The remainder of the survey prompted students to answer informative and demographic questions and the Global Perspective Inventory. Follow-up emails were sent to the students requesting an interview.

A sample of 58 students responded to the email and were interviewed for the study. The interviews were semi-structured and were conducted by trained researchers from each university on students who indicated they had international experience. Supporting follow-up questions were added when further student elaboration was necessary. The interviews aimed to identify and describe emerging themes related to global perspective development not captured by the questionnaire. Table 2 provides demographics of the participants that were interviewed.

Table 2. Descriptive Statistics - Demographic of engineering students interviewed

Gender	n
Male	30
Female	28
Ethnicity	n
White	31
Asian	16
Underrepresented minority	11
Academic Standing	n
Freshman	23
Mid-year	24
Senior	11
University Location	n
Mid-Atlantic	17
West-Coast	18
Midwest	13
Southeastern	10
International Experience Type	n
Domestic	3
Recreational	21
Professional Academic ^a	3
Extended Relocation ^b	2
Study Abroad	18
Service	5
Travel Junkie ^c	6

^a Professional Academic are internship, co-op, or research experiences

^b Extended relocation students lived in another country

^c Travel Junkie's presented anecdotes of multiple of the international experience types

Data Analysis and Coding Protocol

When generating the codebook, interviews were holistically reviewed with an *a priori* coding scheme based on the research objectives and furthered employed an inductive, iterative coding protocol to further refine coding definitions and allow additional themes to emerge not previously addressed within the codebook. This was done by two graduate researchers. The final codebook contained two main categories – Intercultural Wonderment and Learning Outcomes – with twenty-four sub-categories. Both graduate researchers coded all interviews using the final coding protocol and codebook for inter-rater purposes with arbitration where necessary.

QCA will be utilized to determine any potential relationships that may occur between GPI and areas intercultural wonderment that were identified. QCA utilizes Boolean algebra from a “truth table” – a table of 1’s and 0’s to denote the presence or absence of the intercultural wonderment area – to assess a sample for potential conditions or patterns that can be identified as potential causes for a desired outcome [29, 30]. Once patterns are identified, specific exemplary quotes are brought forth to provide further pattern nuance and understanding. Here, QCA will be used to identify which areas, or combination, of intercultural wonderment was the most impactful on students by comparing intercultural wonderment to high scores on the GPI. This will then be used to assess how intercultural wonderment manifests in different types of international experiences.

Preliminary Findings

Initial QCA analysis promotes an emerging possibility that interaction and immersion, either in conjunction with another area of intercultural wonderment or individually, may play a part in fostering engineering student global perspective. Table 3 presents a frequency tally of intercultural wonderment between all 58 interviews.

Table 3. Frequency of the five areas of intercultural wonderment for engineering students

IW Categories	Coding Frequency
Interaction	37
Culture Shock	28
Comfort Zone	27
Immersion	25
Habits and Behaviors	14
Intercultural Wonderment	131

Analysis is not complete and still is in progress to identify additional emerging trends and themes that exist between intercultural wonderment and GPI.

Implication for Engineering Education

The conceptual process of intercultural wonderment may provide an opportunity to gain a deeper insight into how engineering students learn and develop global perspectives in international contexts. Through the qualitative comparative analysis, the study aims to provide specific context of how particular international experiences can mediate this process. The authors expect intercultural wonderment to be displayed within certain international experiences. Additionally, intercultural wonderment will lead to more significant global perspective growths in one of the three GPI dimensions. The authors expect students who express intercultural wonderment during tourism activities will have greater increases in the cognitive dimension and subscales, while higher programs with interactive experiences will exhibit increases in the interpersonal and intrapersonal dimensions and subdimensions. This may help engineering schools and universities better identify and create opportunities and practices that better prepare students for the global workforce.

Next Steps

The current study is a work-in-progress and further analysis between GPI and intercultural wonderment will be conducted. Additional areas of study aim to address the theoretical model of intercultural wonderment's relationship between programmatic components and learning outcomes. Experiences will be classified and analyzed to determine if certain international experiences have greater opportunities to foster intercultural wonderment and are more prevalent to promote particular learning outcomes.

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