Living in an International World: Assessing Students' Global Awareness

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Abstract

Engineers are now often working internationally and across diverse cultures in today's global economy. Therefore, students should become increasingly globally aware in order to be better prepared for a career in an international knowledge-based society. Measuring students' global awareness is not a simple task. In this paper, our primary emphasis is on understanding Science, Technology, Engineering and Mathematics (STEM) students' interest in global awareness. Secondly, we define global awareness knowledge, skills, and abilities (KSA) that need to be met for a student to be proficient in global awareness. We organize these KSAs into learning outcome areas. We define an assessment framework based on the Model of Domain Learning (MDL), where global awareness KSA profiles are mapped against three developmental stages (i.e., acclimation, competency and proficiency) and three different components (i.e., interest, knowledge and strategic processing). Based on this framework, we are creating assessment instruments to effectively assess and track students' global awareness development and engagement throughout their education. In this paper, we present our preliminary findings for the effectiveness of the proposed interest assessment framework.

Keywords– assessment, global awareness, interest

I. Introduction

Engineering educators and practitioners have recognized the necessity of educating globally competent engineering graduates, who will be capable of working globally in collaborative and cross-cultural contexts. According to a National Science Foundation (NSF) article[1] titled, "Investing in America's Future: Strategic Plan", it is reported that the new challenges for science and engineering are becoming global, and these members of the workforce are being asked to collaborate across national boundaries and with different cultural backgrounds.[1] However, limited research has been conducted on the interest of global awareness among the Science, Technology, Engineering, and Mathematics (STEM) disciplines and the method of assessing students' global competency. The challenge of assessing and enhancing global awareness calls for universities in the United States to integrate internationalization into their educational requirements in order for students to succeed in our global society. The goal of this research is to develop a set of assessment tools that allow students' global awareness level to be measured. The specific focus in this paper is measuring the interest level of students in the STEM discipline.

In order to begin to measure students' global awareness, it is first necessary to define global awareness. Reimers[2] defines a globally aware student as a student who:

- Uses 21st century skills to understand and address global issues,
- Learns from and works collaboratively with individuals representing diverse cultures, religions, and lifestyles in the spirit of mutual respect and open dialogue in personal, work, and community contexts,
- Understands other nations and cultures, including the use of non-English languages.

One of the challenges of assessing global awareness is that this skill encompasses relatively broad areas. Therefore, we first defined six distinct global awareness learning outcome areas. The learning outcome areas are also broken down into smaller components in order to outline clearer learning objectives for students' global awareness. Within each learning objective, we then defined the required competencies.

II. Background

II.1 Previous Global Awareness Assessment

Doscher[3] developed two rubrics for a global learning initiative. The first rubric is designed to measure students' global awareness. The second rubric focuses on measuring students' global perspective. Based on an empirical study, Doscher[3] reported that the rubrics were reliable for the measure of students' development of the learning outcomes.

Besterfield-Sacre et al.[4] defined the expected traits for engineering students' global proficiency and preparedness by surveying the experts in the field, regarding the knowledge and professional skills essential to global engineers. Some of the responses from the experts included the ability to interact with engineers from different cultures, cultural awareness (awareness of how national differences are important in defining and solving technical problems), the ability to understand global markets, business, politics, and trade, as well as knowledge of global engineering practices. Although the study focused on engineering, the results can be generalized for other STEM disciplines. Demand for globally aware students will only continue to increase; therefore, the need for the assessment of culturally aware individuals will be even more crucial.

II.2 Learning Outcomes

Defining our learning outcome areas will allow us to map students' global awareness knowledge, skills, and abilities (KSAs) into the Model of Domain Learning (MDL). Alexander et al[5] developed the MDL in order to explain how a person becomes an expert in a field through the changes in his/her strategic processing, knowledge, and interest over three developmental stages (acclimation, competency, and proficiency). Mapping global awareness KSAs will provide us with the ability to asses and track students' levels of global awareness development and engagement throughout their educational careers.

In order to assess global awareness, we have identified six learning outcome areas as follows: interaction, application, collaboration, exploration, intercultural sensitivity, and perception.

When establishing the learning outcome areas, we utilized Bloom's Taxonomy Verb List-Cognitive Domain[6] to define the learning objectives more explicitly. Bloom's list breaks down words into different levels of taxonomy and then gives examples of where and how to use the verbs, in order to achieve accurate assessments of fundamental information. Each learning outcome area has specific objectives. If students meet all of the determined objectives for an outcome, they are then considered proficient in that outcome. We expect that most students will not reach the proficient level until after graduating and working in a globally diverse work place since it takes time to fully develop those skills.

The interaction learning outcome area necessitates, that students interact and communicate effectively with others, as well as to be comfortable around people of diverse backgrounds and cultures.[7, 8] Subgroups for this learning outcome area are designed for the specific learning objectives, which are inclusion, confidence, and sensitivity. Interactions with others from different cultures allow a measurement to be made from the subgroups. The measurement enables us to decipher, if the students truly understand what it is they need to accomplish to be considered globally aware. The book, *Kiss, Bow, or Shake Hands*[9], is a quintessential example of why knowledge in how to interact with a person from another nation is important. The book identifies sixty different countries and gives an outline for each, providing the reader with several cultural questions, addressing the background and cultural orientation of the nation, as well as their business practices, including tips on conducting business and their protocol. All of the material should be taken into consideration while interacting with someone from a different background, as it largely factors into professional capabilities.

The application learning outcome area measures the students' value and application of innovative systems and technologies that utilize critical and creative global professional skills.[10] The subgroups of application are innovation, creativity, and commitment. Within the application learning outcome area is the ideology, that students are open-minded and able to use global technology and skills to find solutions, as well as demonstrate dedication to projects.

The collaboration learning outcome area measures students' ability to work together with two or more people to realize shared goals. Particularly, students should be able to collaborate across cultures and identify cultural differences, in order to successfully participate and compete globally. McGraw[11] states that people from diverse circumstances recognize opportunities better than those without. Using creativity from both cultural and ethnic experiences is fundamental to the long-term economic health. The collaboration learning outcome area is achieved when students working in diverse teams demonstrate that students have the ability to value individual contributions made by each team member.[12]

Exploration has two outcomes that we are examining among students. The first outcome addresses composing exploration of one's self-biases and development of personal philosophies of openness and empathy. The second outcome assesses, if students seek to find commonalities from significantly different cultural and ethnic backgrounds.[7, 8] The subgroups for exploration are observation, identification, and open-mindedness. Students will be able to view the natural behavior of personalities and cultures, identify characteristics and differences within cultures and remain open to any idea related to global awareness.

Intercultural sensitivity is defined as having an increased tolerance of and curiosity about culturally diverse people's beliefs.[8] Knowledge, accept, respect and second language proficiency are the subgroups of this learning outcome area. Understanding world history, global issues, trends, cultural and religious norms, accepting cultural differences as well as tolerating cultural ambiguity, valuing others' beliefs, and being proficient in a second language are all components that will allow students to fully understand Intercultural sensitivity.

The global awareness learning outcome area, perception, is being able to see though, or rise above, certain cultural stereotypes.[7] Objective listening and social behavior are subgroups of perception. The ability to listen to points without bias and understand cultural differences in personal interactions with others through greetings are characteristics students should exhibit upon graduation.

III.   Research Methodology

Interest Assessment of Global Awareness

Our first assessment tool is a global awareness interest assessment, which allows us to establish a base line for determining how interested students are in global awareness. We created a survey that was emailed to engineering students at a university in the northeast United States. The goal of this survey is to be able to see if students are interested in global awareness and investigate meaningful patterns among the groups of students who are interested in this professional skill. Before implementing the survey, we asked our area experts to give us feedback and to perform a content-validation of the survey, and then proceeded to incorporate their feedback. A few examples of questions we asked were: "Have you ever taken a course or attended a seminar about global issues?" and "Rate your level of interest in attending a free workshop on global awareness." Most of the questions in the assessment use a sliding-scale bar, which allows students to slide a bar along the scale to determine their ratings. The scale has three labels for points of reference; but, the students can choose to place themselves anywhere on the scale.

We administered the survey through Qualtrics survey software. The survey was emailed to roughly 2,000 students. We also asked some of the professors on campus to administer the survey to their students in the classroom. Table 1 gives some of the demographics of the students who completed the survey. After data cleaning, we had 260 valid responses: 148 males and 112 females. The three largest groups of majors who completed the survey were Information Sciences and Technology (IST)/Security and Risk Analysis (SRA) (67), Business (64) and Engineering (17). All other majors were combined into the category called "Other." Table 1 breaks the categories up into class standings.

Table 1- Table of Demographics of the Data Collected

		First Year	Second Year	Third Year	Fourth Year
Gender	Male	61	37	24	26
	Female	40	31	21	20
Majors	IST/SRA	29	18	9	11
	Engineering	8	4	4	1
	Business	23	15	14	12
	Other	41	31	18	22
Total	260	101	68	45	46

IV. Results and Discussions

In this section, we introduce our research questions, related survey items, and our findings.

Research Question 1 (RQ1): *Does the student perception, regarding the importance of global awareness, change throughout their education?*

Research Question 2 (RQ2): *Is gender a factor of the perception, regarding the importance of global awareness throughout their education?*

Figure 1 presents the 95% confidence intervals for the means of two survey questions to measure students' perceptions about the importance of global awareness. The first survey question is in accordance with RQ1. The third and fourth year students rated the importance of global awareness higher than the first and second year students. There is a clear trend, that the upperclassmen are rating the importance of global awareness higher than the lowerclassmen. A positive trend with regards to the class standing for both male and female students is noted. Although the difference between male and female students is not statistically significant in each class level, a steeper improvement was observed for female students. RQ2 is unable to be confirmed by the data we have collected so far, but the steeper improvement observed for females requires further investigation. Multivariate ANOVA was used to test the effects of the class standing and gender on the ratings of questions A and B in Figure 1. Table 2 summarizes the *p*-values of significance for the multivariate ANOVA. The low *p*-values also support that there is significant differences in the mean levels of questions A and B in Figure 1 over the class standing. For the factors of Gender and (Gender)*(Class Standings), there is not a significant difference for questions A and B.

Table 2. *p*-value of Significance for the Multivariate ANOVA

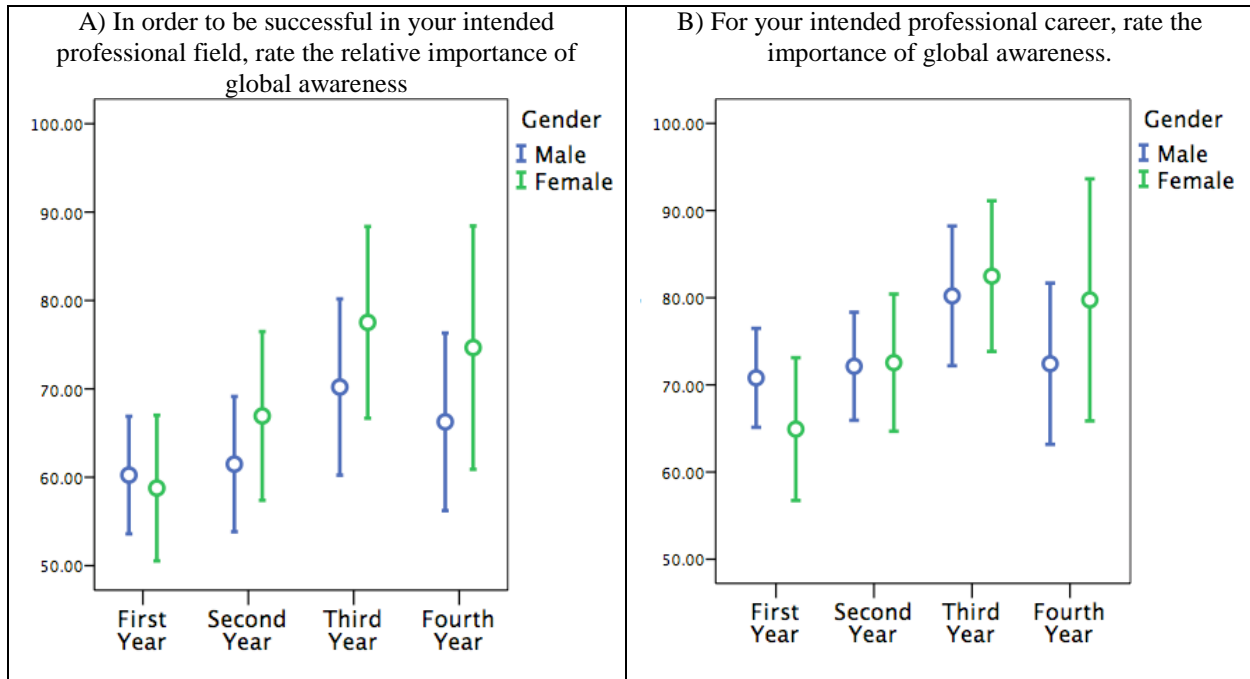| *Factor*	Question A	Question B	Interest
Class Standing	.008	.002	.003
Gender	.143	.381	.203
(Gender) *(Class Standing)	.637	.121	.985

Figure 1- 95% Confidence Intervals for Two of the Assessment Questions to Measure Students' Perceived Importance of Global Awareness by Gender and Class Standing. (Y-axis: 0-not at all important and 100-extremely important.)

Research Question 3 (RQ3): *Does student interest in global awareness increase throughout their education?*

To measure student interest, we have developed a set of survey questions. After testing their internal consistency reliability, the following questions, which had Cronbach's Alpha value of 0.860, are selected:

- Rate your level of interest in attending a free workshop on global awareness.
- Rate your level of willingness to take an elective course in order to improve your global awareness.
- Rate your level of interest in reading literature about global issues.
- While you are browsing a news website, you have spotted an article entitled "Asian Women Challenging Their Ancient Cultural Female Norms." Rate your likelihood of reading this article.
- A renowned global awareness specialist will give a workshop on "issues with intercultural communication in multinational organization" at your institution. Rate your level of interest in attending this workshop.
- A cross-cultural dinner is being held on campus featuring food and music from different parts of the world and it is free to attend. Rate your likelihood of attending the event.
- While you are browsing a news website, you have spotted an article entitled Economic problems in Europe." Rate your likelihood of reading this article.
- While browsing the internet, you come across an article which focuses on global education, how likely are you to read it?

- If an outbreak, such as the Ebola outbreak this past summer, were to happen again, how likely are you to research and learn more about it?

These questions were also operationalized on the continuum scale from Very Unlikely (0) to Very Likely (100) using a slider bar. The average value of the questions was used to represent the level of student interest in global awareness. Figure 2 presents the 95% confidence interval of interest for male and female students over the class standing. Clearly, the students became more interested in global awareness as they go through the first to the fourth year. A Univariate ANOVA was performed to test whether the observed interest means were different across the class standing and gender. The class standing was identified as a significant factor, but not the gender (the *p*-value of the test is also given in Table 2).
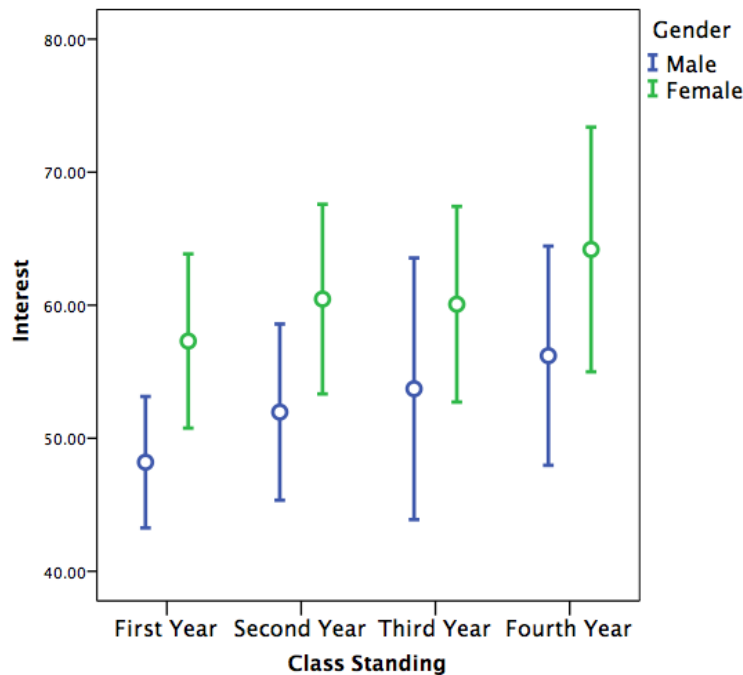

Figure 2. Interest Level against Class Standing and Gender.

The observations in Figure 2 are significant for this research because it is shown that student development in global awareness can be tracked by measuring their interest. Therefore, we recommend interest as a new construct to measure global awareness in addition to other indicators.

Research Question 4 (RQ4): *Do students engage in more activities to improve global awareness throughout their education?*

To answer RQ4, students were asked how many times they did certain activities related to global awareness. Table 3 summarizes survey questions related to RQ4. These questions were operationalized using the following five-point Likert scale: 1-Never, 2- one to two times, 3- three to four times, 4-five to six times, and 5-more than six times. In the table, the average rating of each question is given for each class level. The column slope represents the slope of the linear

regression function fitted to the mean values of each class level. The higher the slope value is, the higher the increased frequency of activities is. Two different *t*-tests were performed to compare the question means across the class levels. In the first test, the four class levels were combined into two levels, lower (the first and the second year students) and upper (the third and the fourth year students). In the second *t*-test, the first year students were compared with the fourth year students. The largest increase was observed in the engagement of students with faculty members to discuss global awareness/issues. The second and third largest increases were in the attending of a diversity training and performing a web search about global awareness. These two items suggest that students' interest in global awareness increased from the first year to the fourth year. This result is also consistent with the observations in RQ3. It is an identified deficit that students do not read enough.

Table 3. Survey Questions Related to RQ4

Question	First	Second	Third	Fourth	Mean	Slope	Upper vs Lower *p*-value	Fourth vs First *p*-value
Attended a seminar about global awareness/issues	1.39	1.65	1.58	1.73	1.58	.095	.142	.021
Read a book about global awareness/issues	1.81	1.85	1.96	2.11	1.93	.101	.130	.125
Read an online article about global issues	3.55	4.04	3.67	3.85	3.77	.053	.967	.214
Read a newspaper/magazine article about global issues	2.55	3.43	3.05	3.28	3.07	.181	.139	.002
Had conversations with your friends about global issues	3.24	3.53	3.68	3.63	3.52	.132	.104	.137
Watched a video clip or foreign film outside of class work about global awareness/issues	2.9	3.16	3.04	3.35	3.11	.123	.308	.091
Attended a speaker event about global awareness/issues	1.49	1.71	1.62	1.8	1.65	.084	.241	.045
Asked questions to a professor about global awareness/issues	1.84	2.22	2.36	2.72	2.28	.278	.001	0
Performed a web search to learn about global awareness/issues	2.7	3.21	3.32	3.41	3.16	.224	.015	.007
Sampled the cuisine of a different culture (e.g., Korean, Moroccan)	3.26	3.6	3.27	3.7	3.45	.099	.658	.101
Attended a cultural dinner or event on campus	1.43	1.43	1.56	1.74	1.54	.106	.065	.079
Coordinated or taken part in a fundraiser for a global issue	1.42	1.38	1.53	1.42	1.43	.015	.518	.97
Attended a diversity training class	1.12	1.4	1.67	1.8	1.49	.231	.000	0

V. Conclusions

Global awareness is an important part of students' professional development; therefore, more measures should be taken to assess this professional skill. In this research, we have established the groundwork to assess students better and find out more about what kind of students are or

have a desire to be globally aware. The ultimate goal of our research is to have assessment tools developed that can be mapped to the Model of Domain Learning (MDL) stages (acclimation, competency and proficiency) and components (interest, knowledge, and strategic processing). We expect to develop an assessment tool for each component and measure student's global awareness development through the MDL stages. We have developed the interest survey and found that there is a significant difference between lowerclassmen and upperclassmen, in terms of how they perceive the importance of global awareness for their career. We also observed, that students' interest in global awareness increased with class standing as the MDL predicts.

VI. Acknowledgment

VII. References

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