Preparing for Student Success in Global Competency and Awareness

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Preparing for Student Success in Global Competency and Awareness

Engineering student global awareness is qualitatively and quantitatively assessed in an engineering-specific preparation course through the undergraduate global engagement office at a large land-grant university. This course was designed to introduce students to global competencies, reflective practice, and foreign language for non-English speaking destinations. Data captured from several semesters indicates a positive trend of student satisfaction and increased competencies. This data is corroborated by identifying important connections between the preparation course content and professional application. This paper is a discussion of the impact of a pre-departure preparation course for study abroad experiences for engineering students.

Although not a degree requirement at the institution, high-impact experiences, like study abroad, provide a real-world application of learned communicative strategies, reinforcing the skills needed to participate meaningfully in a professional community. Study abroad opportunities allow students to enhance their learning and problem-solving skills while partnering with scholars, students, and engineers conducting work and studies related to the institution's curricula. The goal of the course is to enhance students' confidence in their ability to successfully navigate diverse cultures and places, learning and applying the course content in a familiar setting before departing. Engineering students who implement some of the skills and content typically see an immediate return during the experience. The reflective final project that they complete once they return reinforces the awareness and skills that are a link between classroom theory and concepts and real-time impacts.

Through a continuous improvement feedback model, this paper also seeks to identify the range of content that can be refined and leveraged for various locations. Quantitative results indicate that global/cultural skills are relevant immediately, requiring little reinforcement from other courses. This study provides a baseline of data and information to continue developing the pre-departure course and content. Using student- and faculty-derived data and reports, this paper identifies valuable global competency applications and existing student skill gaps. Student evaluations and reported experience are presented as data for course development, ensuring the course at the institution continues to adapt to engineering students' evolving needs and opportunities.

Introduction

Engineers must have the capability to collaborate extensively with colleagues from various cultural and national backgrounds as well as engage with stakeholders across the globe. At an increasing pace, we live in an interconnected society with globalization no longer a novel concept. According to the Organisation for Economic Co-operation and Development (OECD), drastic changes have occurred across the globe, bringing new opportunities and threats that the Covid-19 pandemic and global financial turmoil have hastened, "underscoring the inter-dependency and complexity of today's world [1]." Additionally, the U.N. has indicated that requisite knowledge in "global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development" should be a priority, as articulated in U.N. Sustainable Development Goal 4. The field's commitment to responding to these demands can be seen in

Criterion 3 (Student Outcomes), promulgated by the Accreditation Board for Engineering and Technology [2], indicating that programs must document "an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors."

Global competencies can be described as "global awareness, global understanding, and the ability to effectively apply intercultural knowledge," [3] while "study abroad is typically seen as a primary vehicle for building students' global competence" [4]. Prior to embarking on an international experience, Gaia [5] recommended carefully conceived pre-departure preparation to achieve better cultural awareness and knowledge. Furthermore, the standard's organization for international education, the Forum on Education Abroad, stated that professionals are responsible for preparing participants to be successful through pre-departure preparation.

At the large land-grant university, a faculty member accompanying students to Italy more than a decade ago, observed many student participants to be ill-equipped, neither able to understand the most basic cultural differences nor did they possess the capability to communicate valuable information such as their dietary restrictions. In the simplest terms, preparation is necessary to function. However, building skills to collaborate on a global team and addressing societal challenges that span borders, in a culturally appropriate manner requires a meaningfully designed curriculum. An endeavor to develop a course that could be nimble enough to span all program destinations was conceived. Counsel was sought from faculty from across large land-grant universities, colleges, and institutes. Individuals with expertise in intercultural learning, program leaders, and administrators serving at the dean level with international program responsibilities were consulted. The development of a curricular framework that integrated their feedback was created. One modification to the proposed curriculum was the addition of cultural humility as a focal point. Subsequently, the course STS 115, Pre-departure Intercultural Learning was created, and a decision was made to pilot programs utilizing the draft curriculum.

In 2022, engineering student study abroad returnees were asked to comment on gaps in their pre-departure preparation. Students pointed out that they felt there was a need for information on local culture and the historical significance of the locations. Knowledge of basic language phrases was described as critical, with one student even commenting that they had been unaware that "people spoke Basque instead of Spanish." Daily cultural practices such as purchasing groceries, information on pharmacies, and eating out were discussed extensively. In addition, students highlighted the need to address safety, mindset, and the importance of having familiarity with the area where they would travel. Some anonymous student program evaluations expressed a desire for "coursework before the Maymester program" and that "resources/videos to watch about Singapore before going" would be beneficial. Other evaluations cited the need for "language prep or general knowledge of the area."

Institutional Drivers

Engineering Disciplines

The need for engineering graduates to improve global awareness and competency has been emphasized in multiple disciplines for several decades. The American Society of Civil Engineers (ASCE) Vision 2025 states "The global civil engineering profession has increasingly

recognized the reality of shrinking resources, the desire for sustainable practices and design, and the need for social equity in the consumption of resources." The ASCE Vision aspires for civil engineers to have the language and cultural skills, competency, and experience necessary to practice globally. Future graduates must keep close ties with nongovernmental organizations so that those entities seek engineering insights when setting their global infrastructure policies [6]. The American Society of Mechanical Engineers (ASME) Vision 2030 states that "what mechanical engineers do, and how they do it, are changing due to global issues, expansion of the discipline's boundaries, increased professional expectations, and technological innovation. Future engineers will need outstanding communication and people skills, business sense, a global perspective, and an unparalleled understanding of our environment [7]." Additionally, the report notes that both industry supervisors and early career engineers emphasize that professional skills should be integrated throughout the curriculum, and broaden the skill set to include topics such as global understanding and communication, cultural awareness, and leadership.

ABET

Indeed, the need for global awareness and exposure is emphasized in every engineering discipline. The accrediting board for engineering programs in the U.S. and many schools abroad is ABET, and they define student outcomes as "what students are expected to know and be able to do by the time of graduation." Several of the Student Outcomes highlight the need:

- (2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- (3) an ability to communicate effectively with a range of audiences
- (4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts [2].

These meaningful documents guide all engineering programs and are more than aspirational. They are strategic and designed to affect change, so implementing action to produce students with global awareness and competency starts with the faculty.

University

The Pennsylvania State University's Strategic Plan (2016-2025) spotlighted the need for graduates to have more global awareness and competence. Its mission statement (abbreviated) below shows global engagement several times:

> Mission - Our discovery-oriented, collaborative, and interdisciplinary research and scholarship promote human and economic development, global understanding,…
>
> … create new knowledge and address significant global challenges, prepare our students to live in a global society,…
>
> …[8] Global Engagement Network of regional partnerships enables the University to pursue globally its tripartite mission of teaching, research, and service.

The Strategic Plan's six foundations for implementation also included global engagement. Six foundations underpin all university endeavors and are considered fundamental to effective implementation. These foundations—Enabling Access to Education, Engaging Our Students, Advancing Inclusion, Equity, and Diversity, Enhancing Global Engagement, Driving Economic Development, and Ensuring a Sustainable Future—connect to, empower, and sustain our values as an institution [8].

College

Similarly, the College of Engineering adopted goals and key performance indicators to align with the University's Strategic Plan and ABET requirements, which support engineering-specific vision statements. The mission statement included the "importance of deep disciplinary knowledge as well as transdisciplinary, team-based thinking and problem solving, and global awareness." [9]. One of the subgoals was to expand and enhance global intra-institutional partnerships, with a key performance indicator of "Development of College global partnership network incubating international programming, virtual engagements, intra-institutional grants, research projects, faculty and staff exchanges, and international recruitment graduate; demonstrated increasing inclusion; evidence of the enhanced reputation of the College.

The inclusion of this outcome in the university and college's strategic plans further highlighted the expectation to make global awareness and competency a priority and an attainable outcome.

Methods and Modules

This pre-departure course for undergraduate students majoring in a college of engineering at a large land-grant university prepares students for participation in a global engagement experience (e.g., study abroad or international research program) by introducing global competencies such as cultural humility, mindset, sustainable development, and language instruction. The pre-departure course provides a holistic wrap-around experience as students begin the course prior to traveling abroad, then complete a final project upon return to the U.S. This final project is an articulation of the engaged global learning experience's contribution to the development of each student's personal, academic, and professional goals. The Global Learning Rubric [10], developed by the American Association of Colleges and Universities, provides the framework by which students' learning outcomes are assessed.

Course content and materials are delivered in an asynchronous web format over several weeks before the student's departure for an international learning experience. Content and the number of academic credits assigned to the course depend on the length of time the student will be abroad. For example, a participant in a short-term international program (e.g., one week to ten days) will enroll in a one- to two-credit course fulfilling a general elective whereas those participating in a longer program (e.g., three to five weeks) enroll in a three-credit pre-departure course fulfilling a general education knowledge domain which is required for the baccalaureate degree.

The course introduces key global competencies aimed at enhancing students' confidence in their ability to engage in, and successfully navigate, intercultural learning environments while abroad. Then, upon return, students complete a final assignment that requires personal reflection on the

global engagement experience as well as thoughtful consideration for the transfer of these newly developed skills to their academic and professional communities. The Forum on Education Abroad's *Standards of Good Practice for Education Abroad*, 6th edition [11] (Table 1) informs the pre-departure course's learning objectives (Table 2).

Table 1: Summary of the Forum on Education Abroad Standards for Good Practice for Education Abroad, 6th edition [11]

Before Program
1. Responsible parties shall prepare all students to be successful abroad throughout the program design, outreach, advising, application, and pre-departure processes. 2. Responsible parties shall communicate the value of education abroad for students' personal, academic, and career goals. 3. Responsible parties shall communicate the importance of understanding the social, historical, political, economic, linguistic, cultural, and environmental context(s) for each program and location.
Student Learning Objectives
1. Responsible parties shall evaluate student competencies and place students in language and other courses at their level. Responsible parties shall prepare participants to navigate the cultural transition and to engage in culturally relevant, ethical, and reciprocally beneficial activities in relation to the local context. 2. Responsible parties should encourage students to consider the social, cultural, economic, and environmental impact of each program and to mitigate negative or harmful impacts. 3. Responsible parties shall tell participants the significance of identities including racial, ethnic, sexual, gender, religious, ability, citizenship or nationality, and socioeconomic status in relation to the program context.

Table 2: Course objectives adapted from the Forum on Education Abroad Standards for Good Practice for Education Abroad, 6th edition [11]

Intended Course Learning Outcomes
1. Develop global competencies in preparation for a global engagement experience. 2. Learn about and articulate key points of the international host country's history, contemporary culture, and contextual sustainable development goals. 3. Develop the ability to assess one's own cultural lens and interpret how it influences their worldview. 4. Articulate the impact of the global engagement experience on one's personal, academic, and professional goals. 5. Evaluate students' language proficiency and provide instruction to increase students' abilities in the oral, spoken, and written language of the host country. 6. Increase confidence and ability to explore a new place and culture.

Course objectives are achieved through a series of four learning modules:

Module 1: Mindset
Module 2: Cultural Humility
Module 3: Sustainable Development Goals
Module 4: Language Acquisition or Travel Guide

First, the course begins by introducing the power of a positive mindset. Our intention is to enhance students' global engagement experience by providing a framework that encourages taking chances, personal and professional exploration, and growth. Second, we introduce the concept of cultural humility to prepare students to succeed in adapting to a new cultural and social environment. This includes fundamental lessons about the host country's history, culture, and contemporary social issues. Additionally, students engage in reflective exercises to explore their perceptions of culture and ethics. Third, the UN (United Nations) Goals for Sustainable Development are introduced. Students are asked to examine contemporary issues of sustainable development in their home community before learning about Sustainable Development in the international destination in which they will study abroad. Finally, students are required to complete a travel guide (e.g., modes of local transportation, identification of emergency services, and identification of routes to be frequently traveled) to practice navigating the international destination prior to going abroad. The goal of the Travel Guide assignment is to enhance students' knowledge of, and comfortability in, the place they will visit to help them successfully navigate the location.

Results

Consistent with the Standards of Good Practice for Education Abroad released by the Forum on Education Abroad, learning objectives were forged for several pilot courses that responded to the need for pre-departure preparation. Two study abroad programs served as test cases for region-specific content. These included locations in 1) northern Italy/southern Switzerland and 2) Peru. Both courses were delivered in primarily a remote format. Additionally, a general course was devised and instructed in person to provide students with the tenants of intercultural learning and content necessary for their pre-departure preparation. Although the course was designed to be general, it included components where students customized a destination-specific travel plan. In a later phase of this initiative, a residential course was executed for a winter break program traveling to New Zealand. The pilot phase of the course spanned three semesters with 76 undergraduate student participants, more than half of whom self-identified as white, female, and with a median of 20 years of age (Table 3).

Table 3: Demographic breakdown of participants in the pilot phase of the pre-departure course

		Total	Gender		Race / Ethnicity						
			MN	WM	ASN	BLK	HSP	INT	MLT	UDL	WHT
Enroll-ment Count	SP22	41	18	23	4	5	5	1	2	2	22
	FA22	17	8	9	2	1	1			2	11
	SP23	18	10	8	1	1	2	4		1	9
% of Total	FA22	100%	47 %	53%	12%	6%	6%	0%	0%	12%	65%
	SP23	100%	56 %	44%	6%	6%	11%	22%	0%	6%	50%

In the general course, one student remarked about a guest speaker, "…whenever we had Dr. Ken Graham come in and he explained high context versus low context, that was really helpful because we learned that Italy and Switzerland were both very high context countries, so they would like to get to know each other more before continuing a project, or just really care about personal relationships, which is something I noticed whenever even dinner." Students also had the opportunity to anticipate challenges and reflect on potential growth areas. They identified obstacles such as navigating the language and making cultural adjustments. Opportunities for growth comprised themes that bridged self-awareness, confidence, and moving beyond the proverbial comfort zone.

Regarding developing global competence through their study abroad experience, one student ascribed this to a location-specific STS 115, saying, "I think the thing that helped me developing ability was, specifically for Italy was the pre-departure class." Another participant in a predeparture course said, "a little bit of background history especially was very helpful to learn about because it gave us context, and with context comes understanding." Further, as relates to preparation prior to the study abroad programs, it was stated "having us do essay research was actually very helpful, especially when you're going to another country that you're not really aware of what it will look like, they covered, race, different, cultural aspects that you wouldn't think about."

Data collected on an embedded program traveling to New Zealand were collected through student reflections published on self-created websites. A selection of student responses to the prompts is shared below.

What impact did this experience have on you personally (e.g., growth and cultural humility) and professionally (skills and strengths improved)?

> *"I grew more confident in writing and speaking in a more professional manner as a result of the various presentations and writing assignments. I am not embarrassed to ask questions or to engage with others, regardless of who they are or what positions they hold, which was a problem for me going into this class. The course focused on the rebuilding of Christchurch after earthquake damage, which provided an opportunity to see how people addressed real-world engineering conflicts and solutions. Overall, I feel*

much more comfortable communicating with new faces and facing challenges with an open and focused mind."

Identify and discuss significant elements of the international host country's history, culture, contemporary social issues, and/or contextual sustainable development goals investigated while abroad.

"Another thing that I thought was cool was the revival and interest in [indigenous] culture and language. In the US, we have begun to teach the truth behind Native American genocides and ethnic cleansing, but we still don't make much of an effort to revive or persevere their culture. The [indigenous] culture and language are pretty extensively taught in schools and respected by the community. Although Native American cultures are far more diverse and would be much harder to teach, they still don't receive the respect they deserve in the US."

Share your personal and professional goals for international experience. What did you hope to achieve, or what were the expected outcomes? Please describe how these goals were met or changed during your study abroad experience.

"Being that our group was relatively small in size and we developed a personal relationship before beginning our study abroad program, I developed a sense of comfort in my peers and their support helped me in enhancing my communication skills. I obtained great feedback from my professors which also helped me improve on my skill. Coming out of this trip, I feel more confident in myself and ready to continue working on and developing these vital communication skills which is a necessity in everyday life."

Discussion

Knowledge is acquired in phases, and according to the experiential learning paradigm, this is a reflective recursive process and particularly germane in education abroad [3]. Steps to promote intercultural learning that develops global competencies can foster this iterative learning include pre-departure preparation, as evidenced by the articulated needs and positive student comments on the pilot phases. Upon return from international engagement experiences, students who had enrolled in STS 115 described the successful outcomes they experienced to include an enhanced sense of comfort and confidence. Many stated they felt far better prepared than peers in their cohort who did engage with these courses. However, the implementation of this model to scale into a formal robust pre-departure curriculum remains a challenge, especially for degree-granting engineering colleges, with a rigorous path to graduation. While there is evidence of short-term benefits, a longitudinal assessment should be conducted to determine if the skills gained from the pre-departure course are transferred to participant's engineering education experience in the long term.

Admittedly, there have been mixed reactions from the college's faculty in the implementation phase of this course. Our approach to adding this pre-departure pre-requisite for all students in the college who are going abroad was a top-down approach to meet a need observed by the college's administration. This approach has not been without some pushback from experienced

faculty who were not consulted before this decision about the curriculum was solidified. On the other hand, there has been a positive response to the addition of this course from less experienced faculty leaders, particularly leaders of research-intensive programs.

Although the course was designed by experienced international programs faculty-administrators and informed by the Forum on Education Abroad's Standards for Good Practice in Education Abroad, more consultation with experienced faculty-leaders and transparency of our goals may have been beneficial. To avoid this challenge, we encourage others who may consider the

Lessons Learned / Best Practices

Brubaker pointed out that while "pre-departure and in-country support and interventions have become more robust over the past few decades, re-entry typically takes a back seat to other perceived priorities [12]." Furthermore, Young highlighted the question that if coming home means simply falling back into the same daily patterns before the experience, then it may have been pointless [13]. To help students navigate culture shock and use the opportunity to build on the momentum of one's global competency development, the large land-grant university established a global engineering student returnee program. The program includes a credit-bearing course for study abroad returnees to build on their skills. This course has proved valuable in closing the study abroad loop and as a springboard to additional opportunities. While STS 115 sets up the learners for success and experiential learning occurs abroad, the global engineering student returnee course unpacks the experience. It is subsequently processed through reflection and cohort sharing. It also provides students with additional options to grow their global competence.

The need for a scalable, sustainable model poses a potential barrier to broader implementation. With potentially dozens of faculty-led study abroad programs, developing location-specific relevant content and resourcing courses with faculty to deliver instruction must be solved. Furthermore, faculty-led programs have inherent vulnerabilities, including a leader's inability or disinterest in continuing the programs or as geopolitical situations evolve. A paradigm that permits the course to be nimble and responsive is highly desirable. Beyond the development and delivery of the course, valid assessment of highly qualitative data in a multivariate construct concept of global competency may be difficult. This might be viewed in terms of outcomes from the student and faculty perspectives or by employing a validated instrument, although each has limitations.

Yet another crucial factor is the need for institutional buy-in which reaches across students who would enroll in the courses, the faculty who lead programs, and the institutional perspective on this model's incorporation. Even considering compelling evidence for the inclusion of a formal pre-departure curriculum, if it is to become a requirement for all programs, then support is necessary across stakeholder groups. While moving forward with this initiative, there has been a spectrum of reactions from embracing, hesitation, and opposition. As with any cultural shift, a collaborative approach that allows for the articulation of questions and concerns may contribute to a more successful universal adoption of this practice.

Conclusion

Developing STS 115 has created a much-needed pathway for students to acquire requisite cultural knowledge and skills, enhance safety, and set the stage for deeper learning abroad. Beyond the benefit to the students, this initiative is useful for faculty leaders, as course objectives can be enhanced. Regarding the college and university, they can better fulfill goals in their strategic plans and enjoy mitigated risk. Additionally, this course allows international partners to orientate study abroad students more seamlessly to the local culture. From the perspective of international education, this initiative is defined as a best practice. For the engineering sector, global competencies are essential to solving the most complex challenges. However, scalability and buy-in remain organizational hurdles to surmount. To propel this concept further, the collection of data and evidence of its impact will be critical. This information should be disseminated across stakeholder groups including administration, faculty leaders, and students, to help champion the formal inclusion of STS 115 into the curriculum. Innovative approaches that offer flexibility to students' schedules, such as hybrid or online course options could contribute to the successful adoption of the course. Additionally, flexibility on the workload and content, as most are appropriate for individual programs and learners, could enhance its appeal across stakeholder groups more broadly.

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