BOARD # 351: Developing a Survey Exploring the Impact of Global Undergraduate Experiences on Engineers' Career Pathways (RFE #2308607)

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Engineers are increasingly required to work in a global environment – collaborating with colleagues, suppliers, and customers across cultural and national borders. To prepare engineering students for this global workplace, it is important that we support their development of global competence and related skills [1]. Global engineering programs, such as study abroad, research abroad, or internships abroad, are common approaches for developing these skills [2], [3]. Much of the existing research on global programs, both in engineering education and beyond, has focused on outcomes evaluated during or immediately following students' time abroad [4], [5], [6]. However, to achieve their stated potential, these programs need to prepare students for the work environment after they graduate with their engineering degrees. There is a lack of research exploring these long-term impacts of participation in undergraduate global experiences.

Our project is aiming to fill this gap by exploring the impacts of global undergraduate experiences on engineers' career pathways and approaches to their engineering work. To accomplish this goal, our study aims to address the following research questions:

1. How do global career outcomes compare between engineers who participated in global programs as undergraduate students and those who did not?
2. What global experience, global self-concept, and career choice variables are predictors of global career outcomes?
3. How do global experiences during the undergraduate years and after entering the workforce influence engineers' approaches to engineering work?
4. How do global experiences during the undergraduate years and after entering the workforce influence engineers' career choices?

Understanding these impacts can provide motivation for and support the development of effective global engineering programs for undergraduates.

Our poster will present the results from Phase 1 of our project, which included both the development and deployment of the Global Career Impact Survey. First, we will present the process by which we developed the survey, which involved a five-stage process of survey development and refinement. We will include results from the pilot survey that we conducted as part of this refinement process. Second, we will share initial results from our full deployment of the survey across the three institutions participating in the project, in which we received more than 1000 responses on the survey. We will share summary statistics from our survey responses as well as early analysis addressing RQ1 and RQ2.

Summary of Survey Development Process and Pilot Results (Spring and Summer 2024)

In Phase 1 of our project, we developed the Global Career Impact Survey (GCIS) through the following five stages: (1) Build survey from existing instruments, (2) Review by advisory board, (3) Think-aloud interviews, (4) Time tests, and (5) Large-scale survey pilot. The GCIS is grounded the Social Cognitive Career Theory (SCCT) which characterizes career choices as resulting from interactions between personal, behavioral, and contextual factors [7]. In Stage 1, we built our initial draft of the GCIS by sourcing and adapting questions from several existing instruments. One key source for questions was the Pathways of Engineering Alumni Research

Survey (PEARS) [8], which was used to explore alumni preparation for engineering careers and is also grounded in SCCT. We also drew questions from the Cultural Intelligence Survey (CQS) [9], Global Engineering Competence (GEC) scale [10], and the global engineering survey used by Davis et al. [11]. In Stage 2, we reviewed the initial survey with our project advisory board and made significant adjustments to the survey structure and specific questions based on their combined expertise. In Stage 3, we conducted think-aloud interviews with three potential participants to understand how they interpreted each question on the survey. We made several updates to question wording based on the interviews and stopped after three interviews as we felt we had reached saturation on feedback from the participants. In Stage 4, we had four more potential participants take the survey and time themselves so we could get an accurate sense of the survey length. Based on their feedback, we reduced the number of questions in several sections of the survey. In Stage 5, we conducted a larger scale pilot of the survey with alumni from global programs at two universities that are not part of the main study. In the pilot, we tested the recruitment emails, social media posts, and flyers as well as the survey itself.

We collected 31 complete survey responses from the pilot of the GCIS. The participants provided additional feedback on the survey, the main suggestion of which was to reduce the survey length. We analyzed the pilot responses to see where participants spent the most time and used this information to shorten the survey further. We also used the pilot data to carry out initial analysis of the pilot data to identify whether there was preliminary evidence of validity for the survey before carrying out the larger deployment. Specifically, we conducted regression analysis to explore the relationship between an engineer's engagement in global job tasks and their scores on the GEC and CQS assessments. In our pilot data, both *current* global job task performance (R^2 = .150, $F(1, 29) = 5.120$, p = .031) and *career* global job task performance (R^2 = .224, $F(1, 29) = 8.368$, p = .007) significantly predicted GEC scores. In contrast, neither current global job task performance (R^2 = .016, $F(1, 29) = 0.481$, p = .494) nor career global job task performance CQS (R^2 = .077, $F(1, 29) = 2.435$, p = .129) significantly predicted CQS scores. These findings present some evidence of validity for the GCIS in the positive relationship with GEC scores and suggest future questions to explore with the full data set related to differences between GEC and CQS outcomes for engineers. We will report these findings visually on our poster along with the initial results from the larger study (next section).

Summary of Survey Deployment (Fall 2024 and Spring 2025)

Our project is a multiple-case study where we are collecting data from the alumni of three long-running global engineering programs and a comparison group of alumni from each institution. Figure 1 on the next page provides an overview of the three programs that are the focus of our study and the size of their alumni populations. In Fall 2024, we deployed the GCIS to the alumni listservs of these programs and left the survey open for three weeks. We also used social media posts and flyers as part of the recruitment process. Through this recruitment and some additional targeted recruitment after the official survey window, we obtained 578 complete survey responses (Purdue – 346, Rhode Island – 182, Cincinnati – 50). These responses were generally well-distributed across majors, industries, and years of the program (we will show these demographics on the poster). After reviewing the target group participants' demographics, we worked with the alumni offices at each university to plan a recruitment strategy for comparison group participants at each school. We used similar recruitment methods (email, social media) for

the comparison group and left the survey open for three weeks. Through this recruitment approach we obtained 571 complete responses, but they were heavily weighted towards Purdue (Purdue – 494, Rhode Island – 63, Cincinnati – 14). We are currently reviewing the reasons for this disparity and will carry out additional target recruitment of alumni from University of Rhode Island and University of Cincinnati in Spring 2025. An initial analysis of the comparison group demographics shows good alignment between the target and comparison groups in terms of undergraduate major, graduation year, industry, and gender. We will report this comparison on the poster.

Figure 1. Three Global Engineering Programs – Cases for this Study

After we complete the additional targeted recruitment, we will proceed with the data analysis of all our survey data. Because we are conducting a multiple-case study, we will first analyze the survey responses within each case to determine patterns in the alumni responses from each university. Participation in the target global programs will be one key variable in our analyses, but we will also explore relationships between global task performance (current and career), interest in global work, confidence in global work, GEC/CQS scores, and career variables (e.g., salary, promotions, industry). We will then make comparisons across the cases to determine whether the career outcomes and global work patterns are replicated across cases. We hypothesize that there will be similar outcomes and patterns across cases, given the similarity in the structures and contexts of the programs. We will present the initial results of our analyses on the poster.

Future Work

In Phase 2 of our study, we plan to use purposive sampling based on our data analysis in Phase 1 to select participants from both the global programs and comparison groups for interviews. Through these interviews, we aim to enrich the data obtained from the GCIS and gain deeper understanding of the impacts of global experiences on engineers' career paths (RQ4). The interviews will additionally explore how engineers approach the global aspects of their work and the experiences that prepared them for their global job tasks (RQ3).

Acknowledgements

This material is based upon work supported by the National Science Foundation (EEC-2308607). Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of NSF.

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