Impact of a Global Engineering Course on Student Cultural Intelligence and Cross-Cultural Communication

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RESEARCH

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Introduction

International collaboration is an increasingly important component of engineering work (Bremer, 2008; Parkinson, 2009). This shift brings with it benefits in the form of new ideas and increased creativity in technical problem solving (Johri & Jesiek, 2014). On the other hand, it also introduces new challenges associated with working across differences in backgrounds, education, and national contexts (Bremer, 2008; Downey et al., 2006; Parkinson, 2007). To prepare students for success in this more globally connected workforce, engineering educators should explore different ways to help students develop skills in *cultural intelligence* and *cross-cultural communication*. Study abroad is a common undergraduate experience designed to help students achieve these learning outcomes, but engineers have historically been underrepresented in study abroad programs within the United States (Institute of International Education, 2015). One barrier faced by engineering students is the significant number of credits and sequential classes that make up their degree programs (Parkinson, 2007). Affordability is also a concern for many students, so it remains important to identify ways of helping students develop cultural intelligence on their home campuses (Downey et al., 2006). This paper describes an innovative global engineering program that combines a one-semester, on-campus global engineering course with a two-week study abroad module. Using a mixed-methods strategy, we investigate the influence of both the course and the international module on students' cultural intelligence by capturing data at different points during the program and exploring specific components of the program. This study addresses the growing need to identify a variety of methods of developing cultural intelligence in engineering students.

Literature Review

Engineering educators have developed programs in a variety of formats for teaching cultural intelligence and related competencies, and several authors have sought to classify

these programs (e.g., Downey et al., 2006; Grandin & Hirleman, 2009; Parkinson, 2007). Despite the acknowledged challenges of convincing engineering students to travel abroad (Niehaus & Inkelas, 2016), most of the programs aimed at teaching cultural intelligence include some form of international travel. A key opportunity for addressing these challenges is introducing international projects and topics into coursework, ideally helping students gain cultural intelligence without leaving the country. Previous studies have looked at engineering design courses where U.S.-based students work on international teams with students in other countries (e.g., Maldonado, Castillo, Carbajal, & Hajela, 2014) and traditional engineering science courses that incorporate international case studies (e.g., Rectanus, 2013).

It is less common to find examples of courses explicitly focused on the topic of global engineering practice, although there is widespread support that engineering students need to acquire this skill (Grandin & Hirleman, 2009). One notable exception is the Engineering Cultures course described by Downey et al. (2006), which is designed to fulfill a humanities requirement while teaching students about the history of engineering in different countries and its impact on engineering practice today. Nevertheless, this space remains an area where further curriculum development and research are needed.

Beyond engineering education, research has focused on identifying specific types of experiences that lead to the development of cultural intelligence. For example, through the study of service learning trips, Kiely (2005) documented contextual border crossing, dissonance, personalizing, processing (i.e., reflection), and connecting with community members to be significant parts of the learning process. Others have found that simply studying abroad is not enough to gain cultural intelligence (Spenader & Retka, 2015; Vande Berg, Connor-Linton, & Paige, 2009) and that learning relates to how much students push themselves to seek new experiences and get outside their comfort zones (Engberg, Jourian, & Davidson, 2016). Pre-travel orientation, in-country mentorship, and post-travel coordinated reflection have also been documented as significant to student learning through study abroad (Vande Berg et al., 2009; Vande Berg & Paige, 2009).

Breaking down the study abroad experience into these component parts and understanding which ones are the most impactful allows educators to calibrate such experiences with students on their home campuses. For example, courses could offer students experiences with dissonance, connecting students to people unlike themselves, reflection, and pushing students outside their comfort zones. Exploring methods for and impacts of creating these experiences in a classroom setting is a relatively uncharted area of research, but one that is essential to expanding opportunities for more students to develop cultural intelligence through their undergraduate programs.

Conceptual Framework

Cultural intelligence has been referred to using many different terms, including global competence, intercultural sensitivity, and cross-cultural communication. In our study we use Ang et al.'s (2007) definition for this construct: "an individual's capability to function and manage effectively in culturally diverse settings" (p. 336). Although several models have been developed to describe this concept (e.g., Bennett, 1986; King & Baxter Magolda, 2005), there are commonalities between them. Many of these models describe a developmental framework where individuals move from earlier to later stages across multiple dimensions of development. These dimensions represent different types of development that combine together to describe a larger construct, allowing for the possibility that individuals may develop along dimensions at different rates (Evans, Forney, Guido, Patton, & Renn, 2010). The current study adopts this developmental perspective on cultural intelligence and measures four different dimensions: *Cognitive*, *Meta-Cognitive*, *Behavioral*, and *Motivational.*

The *Cognitive* dimension addresses the "knowledge" component of cultural intelligence. Building this knowledge involves developing an awareness of cultural norms, practices, and conventions (Ang et al., 2007). Understanding both the common behaviors of another culture and reasons for these behaviors can improve an individual's ability to interact successfully and respectfully within that culture (Brislin, Worthley, & McNab, 2006).

The *Meta-Cognitive* dimension considers the mental processes used to expand one's cultural understanding. Part of developing cultural intelligence is monitoring and adjusting mental models surrounding cultural norms and practices (Ang et al., 2007). Providing training with reflective prompts to prepare students for interactions that include cultural differences can help individuals begin to develop this skill (Triandis, 2006).

The *Behavioral* dimension describes the ability of an individual to practice appropriate actions when interacting with another culture. Both verbal and non-verbal aspects of behavior are important in adjusting to different cultural settings (Ang et al., 2007). Learning such behavior often requires a combination of training and experience in which individuals actually interact in cross-cultural situations (Triandis, 2006).

The *Motivational* dimension captures the energy an individual devotes to learning about cultural differences and how to work across them (Ang et al., 2007). The magnitude of this energy relates to their expectation of succeeding and value for achievement of a specific task (Eccles & Wigfield, 2002). Thus, an individual's motivational cultural intelligence connects to both their interest and confidence in interacting across cultures.

Taken together, the *Cognitive*, *Meta-Cognitive*, *Behavioral*, and *Motivational* dimensions comprise the conceptual framework for cultural intelligence used in this study. These components combine to describe the knowledge, skills, and attitudes that are required to interact successfully across cultures (Ang et al., 2007).

Background

The Rising Sophomore Abroad Program (RSAP) is a global engineering program for first year engineering students at Virginia Tech that combines a semester-long, on-campus course with a two-week international module the following summer. Its goals are for students to be able to define global engineering practice, recognize contextual influences on problems and solutions, and explore how diversity influences engineering practice. As RSAP has grown, it has expanded from one international module in 2015 to six different international tracks enrolling 135 total students in the 2017 program. Students are selected for the program during their first semester on campus through an application process that involves multiple short essays. They are then assigned to tracks based on application score and personal preference. Students in all tracks take the same on-campus course together and complete the same assignments in the spring and after their trips. The program (course and international module together) counts for three credits as a general education elective, fulfilling a "global" requirement that all students must meet as a part of their degree plans. The course is taught by a single instructor who is also the director for the program as a whole. Other faculty members and graduate students from the department housing the program volunteer to serve as track leaders on the various international modules.

The RSAP course, *Global Engineering Practice*, addresses global engineering challenges, cross-cultural collaboration, and travel preparation skills through group projects and speakers invited from across campus and industry. Assignments and in-class activities challenge students to think about problems from multiple perspectives, interview engineers from other countries, participate in cultural simulations, and reflect on each experience. In addition to preparing students for the international module, the on-campus course aims to increase students' cultural intelligence by giving them experiences that research indicates should help in this developmental process. After final exams, students depart on one of the international modules, which are listed for the 2015–2017 programs in Table 1. The RSAP program costs $2000-$4250 per student depending on the track, which vary in duration and airfare expenses. Scholarships are available on a limited basis for students with demonstrated financial need as indicated by the FAFSA.

The course syllabus and a sample itinerary can be found in Appendices A and B. Further description of the design and assessment of the RSAP program is available in other

publications about the program (e.g., Davis & Knight, 2017; Knight, Davis, Kinoshita, Soledad, & Grohs, 2017; Ogilvie et al., 2015).

Table 1. RSAP Tracks for 2015, 2016, and 2017

2015	2016	2017
Europe: Italy, Switz., & Germany	Europe: Italy, Switz., & Germany	Europe: Italy, Switz., & Germany
Dominican Republic (Service Learning)	Dominican Republic (Service Learning)	Dominican Republic (Service Learning)
	China	China
		South Africa
		Australia & New Zealand
		United Kingdom & Ireland

Purpose and Research Questions

The purpose of this study is to explore student learning across different components of the RSAP program. First, we compared the impacts of the on-campus course to the impacts of the short-term international module on different dimensions of students' cultural intelligence. Next, we focused on cross-cultural communication experiences highlighted by students during the international module to determine more specifically what students learned from this particular aspect of the program. We addressed the following research questions:

1. How do students' cultural intelligence scores change between the pre-course, post-course, and post-trip administrations of the Cultural Intelligence Scale (CQS)?
2. What do RSAP students learn from cross-cultural communication experiences during the international module?

Methods

To address the research questions, we followed a mixed-methods approach that analyzes both survey data as well as a reflective assignment. We began this study by conducting Confirmatory Factor Analysis (CFA) on the Cultural Intelligence Scale (CQS) to verify that this instrument is valid in our context. After obtaining those results, we used paired t-tests and repeated measures ANOVA to compare students' pre-course, post-course, and post-trip CQS scores for the 2015–2017 cohorts of the RSAP program. Lastly, we analyzed essays submitted at the end of the RSAP 2016 program using two rounds of coding.

Data Collection

Cultural Intelligence Scale

The CQS instrument measures the four dimensions of cultural intelligence described in the Conceptual Framework section: *Cognitive*, *Meta-Cognitive*, *Behavioral,* and *Motivational*. The survey was developed using data collected from undergraduate students in Singapore and confirmed as a four-factor instrument based on the original data. It was cross-validated with data from students in both Singapore and the United States and tested for reliability using a subset of respondents four months after the initial administration. In all cases, the instrument was found to be valid and reliable (Ang et al., 2007). A sample item from each scale is shown in Table 2 below. For a full list of CQS items, see Appendix C. Respondents are asked to rate each item on a scale from 1 ("Strongly Disagree") to 7 ("Strongly Agree").

Table 2. Sample CQS Survey Items (from Ang et al., 2007)

CQS Scale	Sample Item	# of Items
Cognitive	I know the legal and economic systems of other cultures.	6
Meta-Cognitive	I am conscious of the cultural knowledge I use when interacting with people with different cultural backgrounds.	4
Behavioral	I vary the rate of my speaking when a cross-cultural situation requires it.	5
Motivational	I enjoy interacting with people from different cultures.	5

Reflective Assignment

After the RSAP 2016 students returned from their time abroad, they were required to write a 1000-word essay in which they pretended that they were being interviewed for an internship. The goal of this assignment was for the students to reflect on their experience as a whole to identify personal growth, key experiences, and application to their future careers as engineers. The prompt for the essay was as follows:

I see you participated in an international experience. That's very unusual for a first-year engineer and is fantastic that you were selected for this program.
- What new knowledge or skills did you learn or build upon while you were abroad?
- What specific examples from the in-semester class or international module helped you develop those skills?
- How can the RSAP international experience be a value-add for my company/organization?

In an initial reading of the essays, we observed that many students discussed cross-cultural communication experiences (i.e., cases where they communicated with someone who did not speak English) as significant learning opportunities. This type of scenario was one of the most common examples given in response to the second question in the essay prompt, inspiring further exploration of this phenomenon through the current study. Cross-cultural communication experiences also give students a chance to demonstrate and reflect on several of the dimensions of cultural intelligence described earlier, allowing us to connect this analysis with the quantitative results.

Participants

Study Context and Demographics

The program in this study is located at a large research university in the Mid-Atlantic region. The students who participate in the RSAP program are first year engineering students in their second semester in college. These students are part of a general engineering program and have not been admitted into a specific engineering major when they participate in RSAP; thus, students enrolled in the program express interest across the whole spectrum of 14 undergraduate majors offered at the university. Gender and race/ethnicity information for the 2015–2017 cohorts of the RSAP program are included in Tables 3 and 4.

Table 3. Gender Breakdown for RSAP 2015-2017

Gender	2015	2016	2017	Total
Men	19	36	68	123
Women	21	43	51	115
Not Reported	6	12	4	22
Total	46	91	123	260

Table 4. Race/Ethnicity Breakdown for RSAP 2015-2017

Race/Ethnicity	2015	2016	2017	Total
Two or more	4	4	6	14
Asian	4	4	16	24
Black	2	3	8	13
Hispanic/Latino	1	6	3	10
White	27	60	83	170
Not Reported	8	14	7	29
Total	46	91	123	260

As shown in Table 5, the RSAP program tends to be more diverse than the College of Engineering (COE) with respect to gender and slightly more diverse with respect to

underrepresented minority groups. The "Not Reported" category is not included in these calculations because of differences between RSAP data and College data. We only included races/ethnicities that appeared in the RSAP data, although others appear in the COE data (e.g., American Indian and Native Hawaiian).

Table 5. Comparison of RSAP Cohorts to COE Demographics

Demographic Category	RSAP Program			College of Engineering		
	2015	2016	2017	2015	2016	2017
Men	41%	40%	55%	79%	78%	78%
Women	46%	47%	41%	21%	22%	22%
Two or more	9%	4%	5%	4%	4%	4%
Asian	9%	4%	13%	11%	12%	12%
Black	4%	3%	7%	3%	3%	3%
Hispanic/Latino	2%	7%	2%	5%	5%	6%
White	59%	66%	67%	63%	62%	61%

Survey

We used data from the 2015, 2016, and 2017 RSAP cohorts for this part of the study because these are all the years for which we have CQS data. The sample sizes for each cohort for each administration of the survey are shown in Table 6. In all three cohorts, students completed the CQS via an online survey on the first day and last day of the on-campus course during class time (we refer to these as the pre-course and post-course administrations). Starting in 2016, we also administered the CQS via email after the students returned from their international modules (the post-trip administration). In accordance with IRB guidelines, the instructor introduced the research project on the first day of class, and students were given the option to opt in or opt out of the study. The teaching assistant collected signed consent forms from students, and the instructor did not know which students signed a form until after course grades were reported. Only the results from students who signed consent forms are included in this study. No incentives were provided to students for agreeing to participate in the study.

Table 6. Sample Sizes

RSAP Cohort	Pre-Course CQS	Post-Course CQS	Post-Trip CQS
2015	46	46	N/A
2016	91	89	41
2017	123	117	94
Total	260	252	135

Reflective Assignment

We analyze 2016 cohort data from 84 students who completed this assignment, including 23 students from the China track, 27 from the Dominican Republic track, and 34 from the Europe track. In accordance with IRB guidelines, 83 of those students provided consent to use their assignments for research purposes, so only these essays were analyzed for this study.

Data Analysis

Confirmatory Factor Analysis

Our goal in performing CFA as a part of this study was to ensure that the CQS is valid to use in our context. Although the CQS was developed using undergraduate student data, it is still best to check for measurement invariance when using an instrument across different groups (Gallagher & Brown, 2013). We used the pre-course CQS results for 2015–2017 to conduct CFA, which gave us a sample size of 260 students. Because the CQS has 20 items, this sample size is more than enough to satisfy the various rules of thumb which suggest 10-15 participants per item. The sample also approached 300, which is the value where researchers suggest that the number of participants per item ratios become less important (DeVellis, 2012). Within the R programming language, a package called *lavaan* has a function specifically for CFA which was used to complete this analysis (Beaujean, 2013). The pre-course CQS data and the expected model for the instrument (shown in Table 7) were the inputs for the CFA function.

Table 7. Expected Model for the CQS

CQ Factors	Item Distribution
Cognitive	Items 1, 2, 3, 4, 5, 6
Meta-Cognitive	Items 7, 8, 9, 10
Motivational	Items 11, 12, 13, 14, 15
Behavioral	Items 16, 17, 18, 19, 20

In interpreting the results, we reviewed the Comparative Fit Index (CFI), the Tucker Lewis Index (TLI), the root mean square error of approximation (RMSEA), and calculated Cronbach's alpha for each scale of the CQS. These measures give scores between 0 and 1, with desirable values shown in Table 9 in the Results section (Field, Miles, & Field, 2012; Gallagher & Brown, 2013).

Paired T-Tests

Paired t-tests were used to make two comparisons of the students' CQS results: pre-course versus post-course (i.e., influence of the course) and post-course versus post-trip (i.e., influence of the trip). Because a few students in each year did not complete the post-

course assessment, the sample size for the first analysis was 252. The second analysis had a sample size of only 130 because we did not administer the CQS post-trip in 2015, experienced low post-trip response rates in 2016, and five students who completed a post-trip survey had not completed a post-course survey. Aggregate scores were calculated for each scale on the CQS by averaging the relevant items, and these values were compared using the t-tests. We used *one-tailed* t-tests in this study because we anticipated that the CQS scores would increase from pre-course to post-course to post-trip (Krathwohl, 2009). To control the familywise error rate, we used a Bonferonni correction in the t-tests (Field et al., 2012). The t-tests were also completed with the R programming language, using the *pairwise.t.test* function.

Repeated Measures ANOVA
For the 130 students for whom we had three CQS data points, we also conducted a repeated measures ANOVA to compare their scores across all administrations. We used the aggregate scores for each scale of the CQS and conducted a separate ANOVA for each scale. We used the *ezANOVA* function that is part of the *ez* package within the R programming language to conduct this analysis (Field et al., 2012).

Qualitative Coding
We completed two rounds of coding to address the identified research question. In the first round of coding a yes/no coding scheme was used to answer the question: *Does this student discuss a situation where they communicated with someone who did not speak English and describe something that they learned from the experience?* In the second round of coding, essays that were coded "yes" were analyzed more closely and coded using a constant-comparative open-ended coding scheme (Charmaz, 2003; Miles, Huberman, & Saldaña, 2014, Ch. 4) to answer the question: *What did this student say they learned from the cross-cultural communication experience?* Some essays received multiple codes in the second round of coding if the student discussed multiple lessons related to a cross-cultural communication experience. These codes were then quantized (Borrego, Douglas, & Amelink, 2009) to identify trends across international tracks and to look for larger trends within the themes.

Data Quality

Before completing the quantitative analyses, we conducted several checks to ensure that the data set was appropriate for the analyses we wanted to use. For CFA, it is important to check the correlation matrix to ensure that the variables are not over-correlated, which would indicate multicollinearity (Schreiber, Nora, Stage, Barlow, & King, 2006). The correlation matrix for the pre-course CQS data revealed that the correlations all fall below 0.8, so we concluded that multicollinearity was not a problem in this data set (Field et al., 2012). Next, we checked the normality of the pre-course data by calculating descriptive

statistics for each of the 20 items on the CQS. Because the absolute value of the skewness was less than 2.0 and the kurtosis less than 7.0 for all items, we concluded that the data were sufficiently normal for this analysis (Curran, West, & Finch, 1996). Confirming that there were no problems with multicollinearity or non-normality, we were ready to proceed with conducting the CFA (Schreiber et al., 2006).

For the paired t-tests, we checked the normality of the differences between the pre-course and post-course values; since t-tests are less robust than CFA, we looked more stringently for proof of normality (Field et al., 2012). We believe that our data were sufficiently normal for this analysis as the absolute skewness was below 1.0 and the kurtosis below 2.0 for all items, and the variances were close to equal across items (Krathwohl, 2009). Moreover, the relatively large sample size alleviates this concern. For the repeated measures ANOVA, we checked the assumption of sphericity using Mauchly's test; the results for each scale are shown in Table 8. Because three of our scales had significant p-values, we rejected the assumption of sphericity, and therefore considered the Greenhouse-Geisser correction when analyzing the results for these scales (Field et al., 2012). This correction is part of the standard output for the *ezANOVA* R function, with the values for this reported in the results section below.

Table 8. Results of Mauchly Test for Sphericity

Scale	Mauchly's Test p-value
Cognitive	.840
Meta-Cognitive	>.001*
Behavioral	.004*
Motivational	.009*

*Note: * indicates significant p-value (p < .05).*

For qualitative research, it is important to use multiple methods of increasing the trustworthiness of the results (Creswell, 1998; Leydens, Moskal, & Pavelich, 2004). In this study, we used multiple methods of data collection, and our conclusions represent a triangulation of the results from both methods. In addition, we have provided a thorough description of the RSAP program and student participants, which may help readers determine transferability of our results to their own context (Leydens et al., 2004). The results of these analyses have been reviewed by multiple researchers both within and outside the research team, providing feedback and suggestions for more valid interpretation. Finally, we report several student quotes to support our qualitative findings, allowing the reader to assess our conclusions for themselves.

Limitations

This study has several limitations. First, although the goals of the RSAP course remained constant across all three years of data used in this analysis, portions of the class changed between years. The list of external speakers in the class differed slightly from year to year, and the assignments were adjusted each year based on course evaluations and instructor observations. These changes were made with the intent of improving the course, so it is possible that the later cohorts of RSAP might achieve greater learning than the earlier cohorts. Similarly, as we have increased enrollment, it is possible that the characteristics of the incoming students have shifted as well as the nature of the experience (i.e., a small class environment compared to a larger class environment). To check for this variation, we ran an ANOVA analysis comparing pre-course, post-course, and post-trip CQS scores across years, and found no significant differences for any of the administrations. Nevertheless, it is important to note that variations in student characteristics and course content are not accounted for in the results of this study.

Second, a small group of RSAP students did not complete the post-course CQS survey (n=8), and they were dropped from the analysis for the t-test portion of this study. Although we have a large enough sample size without these students, it is possible that they did not complete the survey because they were less engaged in the class. Similarly, there was a large portion of students who did not complete the post-trip survey in 2016 (n=50). We suspect this occurred because the survey was administered during the summer, but there may be other reasons. These response rates may mean that we are missing an important part of the sample, resulting in a slightly positive bias to our results. However, a comparison of pre-course scores between respondents and non-respondents indicated few significant differences.

Results

The results of this study reveal that the CQS model fits well with the RSAP data, and student CQS scores increase both from the pre-course to post-course and from post-course to post-trip administrations of the CQS. The reflective essays provide insight into the types of skills that students are taking away from the RSAP experience.

Confirmatory Factor Analysis
The results for several measures of model fit (discussed previously) are presented in Table 9 alongside the desired values (Beaujean, 2014; Gallagher & Brown, 2013). In all cases, the RSAP data fit well with the theoretical CQS model.

Table 9. RSAP Data CFA Results

Measure	RSAP Results	Target Values
Comparative Fit Index (CFI)	0.954	>= 0.95
Tucker Lewis Index (TLI)	0.946	>= 0.95
Root Mean Square Error of Approximation (RMSEA)	0.055	<= 0.06
Cronbach's Alpha (for each scale)	0.84, 0.85, 0.91, 0.87	>= 0.7

The path diagram for the model is shown in Figure 1 below. The four circles in the center represent the four scales of the CQS (Cgn = Cognitive, MtC = Meta-Cognitive, Bhv = Behavioral, and Mtv = Motivational) and the boxes around the edge are the 20 CQS items. This diagram indicates correlations between the four factors (indicated by the double-sided arrows), which is consistent with the conceptual framework that these factors are components of the larger construct of cultural intelligence. The arrows from the factors to the measured variables show the model paths with their standardized factor loadings. All paths in the diagram are significant at the $p < .001$ level.
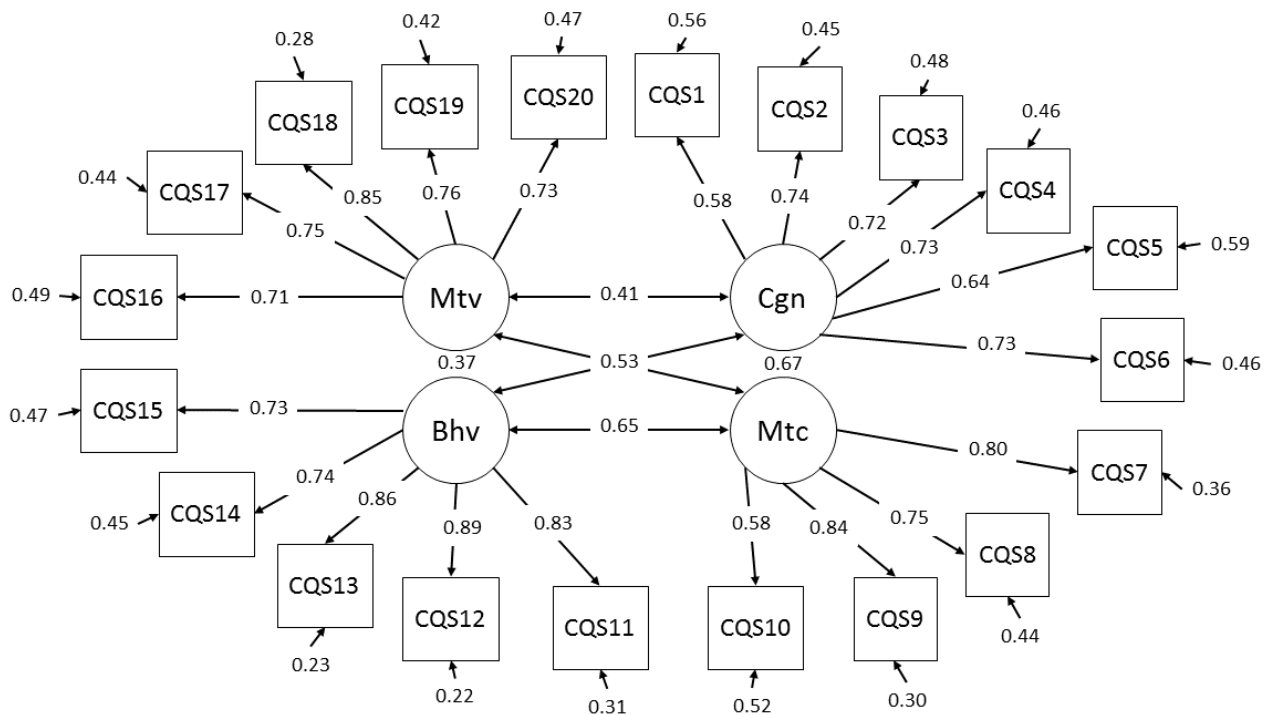

Figure 1. Path Diagram for CFA Analysis

Paired T-Tests

The results of the paired t-tests reveal that student scores on the CQS increased between the pre-course to the post-course administrations. All of the scales saw a significant increase in average score ($p < .05$). The full results are shown in Table 10. Cohen's d was calculated to understand the effect size for each scale, revealing large effects for the first three scales (>0.5) and a small effect for the *Motivational* scale (>0.1; Field et al., 2012).

Table 10. T-Tests Comparing Pre-Course and Post-Course CQS Scores

Scale	df	Pre-Course Mean	s.d.	Post-Course Mean	s.d.	Diff.	T	p	Sig.	Effect Size
Cognitive	251	3.31	1.01	4.02	1.16	0.71	9.71	>.001	***	0.61
Meta-Cognitive	251	4.81	1.06	5.47	1.02	0.66	8.60	>.001	***	0.54
Behavioral	251	4.57	1.21	5.18	0.99	0.61	8.25	>.001	***	0.52
Motivational	251	5.49	0.96	5.64	0.97	0.15	2.47	.021	*	0.16

*Likert scale from 1 = "Strongly Disagree" to 7 = "Strongly Agree." Significance levels are * = p <.05, ** = p <.01, *** = p <.001.*

The paired t-tests between the post-course and post-trip administrations also revealed that CQS scores increased, but with smaller effect sizes than in the first comparison. The *Meta-Cognitive* and *Behavioral* scales had small effects (>0.1) while the *Cognitive* and *Motivational* scales had medium effects (>0.3; Field et al., 2012). The *Motivational* scale is the only one with a larger effect size after the trip than after the course. The results are shown in Table 11.

Table 11. T-Tests Comparing Post-Course and Post-Trip CQS Scores

Scale	df	Post-Course Mean	s.d.	Post-Trip Mean	s.d.	Diff.	T	p	Sig.	Effect Size
Cognitive	129	3.99	1.21	4.42	1.16	0.43	4.38	>.001	***	0.38
Meta-Cognitive	129	5.50	1.04	5.74	0.97	0.24	2.80	.009	**	0.25
Behavioral	129	5.12	1.04	5.38	1.10	0.26	3.12	.004	**	0.27
Motivational	129	5.60	1.04	5.96	1.02	0.36	4.60	>.001	***	0.40

*Likert scale from 1 = "Strongly Disagree" to 7 = "Strongly Agree." Significance levels are * = p <.05, ** = p <.01, *** = p <.001.*

Repeated Measures ANOVA

The results of the repeated measures ANOVA revealed that there were significant differences across the three distributions of the CQS for all four scales. The full results of the analysis are shown in Table 12 below. As described previously, three of the four scales did not meet the assumption of sphericity, so we used the Greenhouse-Geisser correction for those three scales. This correction adjusts the degrees of freedom used to assess the F-statistic and is the more conservative of possible corrections (Field et al., 2012). We report the generalized eta-squared for effect size, which is an output of the *ezANOVA* R function. These values indicate only small effects (>0.1) in CQS gains across all three

administrations. This suggests that although students generally gain cultural intelligence from one administration to the next (per the t-test results reported above), fewer students experience gains across all three points in time.

Table 12. Repeated Measures ANOVA Results

Variable	F-Statistic	df	p-value	GG Estimate	GG p-value	Effect Size
Cognitive	59.99	129, 258	>.001*	N/A	N/A	0.14
Meta-Cognitive	48.11	115.33, 230.65[+]	>.001*	0.894	>.001*	0.14
Behavioral	49.54	118.94, 237.88[+]	>.001*	0.922	>.001*	0.11
Motivational	21.26	120.36, 240.71[+]	>.001*	0.933	>.001*	0.05

Note: significant p-values indicated with *, adjusted degrees of freedom indicated with +.

Reflective Essays

In the first round of coding, 47 out of the 83 essays were coded "yes," indicating that 57% of students discussed a cross-cultural communication situation as a top learning experience in RSAP. Although students discussing these types of situations were identified in all of the international tracks, the percentage varied from 74% for the China Track to 45% for the Europe track. The complete results for this round of coding are shown in Table 13.

Table 13. Number of Essays Discussing Cross-Cultural Communication by RSAP Track

RSAP Track	# Essays Coded "Yes"	Participants	% Essays Coded "Yes"
China	17	23	74%
DR	15	27	56%
Europe	15	33	45%
Total	47	83	57%

In the second round of coding, nine themes emerged that describe what those 47 students felt they learned from their cross-cultural communication experiences. These themes were relatively consistent across tracks and can be grouped into four broad categories: communication skills, personal skills, new insights, and change of perception. The following sections describe these categories in greater detail and provide example quotes from each theme represented in Table 14.

Table 14. Coding counts for cross-cultural learning themes by RSAP track

What did the student learn?	China	DR	Europe	Total
Communication Skills				
Less reflection, focus on direct application of learning				
General intercultural comm. skills	8	6	9	23
Body language	2	6	5	13
Foreign language proficiency	0	2	1	3
Personal Skills				
Deeper reflection, learning from discomfort, general application of learning				
Self-confidence	4	3	3	10
Patience	2	2	2	6
New Insights				
Some reflection, learning from information gained, no application discussed				
Cultural understanding	2	2	1	5
Importance of communication	2	1	0	3
Change of Perception				
Deeper reflection, applying learning to the experiences of others				
Empathy	2	1	2	5
Self-awareness	1	0	1	2

Category 1: Communication Skills. A majority of student descriptions of cross-cultural communication experiences were coded as one of the themes in the *Communication Skills* category. These themes are characterized by students' discussion of specific communication skills, indicating a focus on applying the lessons from their experience in a similar cross-cultural communication situation. Such a focus implies a relatively shallow level of reflection on how the experience may impact their futures as compared to the student comments captured by the other categories. The largest theme within the *Communication Skills* category is *General Intercultural Communication Skills*, in which students shared their tips and tricks for how to communicate across cultures. Some characteristic examples of comments that fell within this theme include:

> *Being abroad taught me how to convey my message in the most efficient way possible with as little confusion as possible.*

> *Being able to control the tone of one's voice during interactions is surprisingly important.*

> *When communicating ideas to a client or the rest of a team, or when trying to comprehend someone else's ideas, it is important to have the ability to recognize whether the audience has understood or if they require additional clarification.*

These quotes focus on specific communication skills that students anticipate being able to apply again in future cross-cultural communication situations.

Body Language represents the second most common theme identified in the essays. Most responses within this theme were general comments on the importance of body language in cross-cultural communication settings, for example:

> *It is important to use body language such as facial expressions and hand gestures if you are talking to someone who may not speak the language you are speaking.*

This sentiment was repeated in many essays across all three international tracks. Less common, but similarly focused on cross-cultural communication situations, were students who discussed the development of their *Foreign Language Skills* through their experiences. These essays typically shared a story of the student having one or more lengthy conversations with someone in a foreign language, concluding with a summary thought such as:

> *This allowed me to expand my Spanish vocabulary and build upon the Spanish knowledge I thought I had lost.*

Although both of these themes represent important lessons to learn while traveling abroad, these conclusions remain focused on a direct application to a similar situation in the future. This trend within the *Communication Skills* themes is what differentiates them from those grouped into the remaining categories, where students started to consider how they could apply their experiences abroad to situations back at home.

Category 2: Personal Skills. The themes grouped into the *Personal Skills* category represent essays in which students described a broader type of learning from their cross-cultural communication experiences. These themes capture a deeper level of reflection in which students considered how their experience might apply across a variety of contexts. Although fewer essays aligned with the themes in this category, the *Self-Confidence* theme was the third most common theme across all essays and appeared evenly across all three tracks. This theme is characterized by students discussing their discomfort and/or nervousness in facing a cross-cultural communication situation but stepping into it nonetheless and finding themselves equal to the challenge. Two students who described this kind of learning reflected on the experience in the following ways:

> *This made me a more active learner and as a result I have confidence that I can approach any challenge put forth with hard work and determination, a skill that was harnessed during my time overseas.*

> *This event made me realize that I am capable of much more than I might think I am; I just need to be confident in my skills and prior knowledge.*

Similarly, the *Patience* theme emerged in the essays of students who found the cross-cultural communication experience frustrating at first, as described by this student:

> *I learned how difficult it could be to communicate and the need for patience since it is frustrating when something cannot be easily communicated.*

These students have begun to reflect on the experience sufficiently to see that the skills they practiced may be applicable in a general sense and in different settings. They also consider in more depth the feelings that they experienced during their cross-cultural communication situations (discomfort or frustration), and this experience influenced what they took away from the program.

Category 3: New Insights. The themes in the *New Insights* category describe intellectual understanding that students gained from their cross-cultural communication experiences. For example, in the *Importance of Communication* theme, students began to recognize that they often take the ability to communicate for granted. One student described it this way:

> *When you are in a city full of people who cannot speak any of your language and whose language you cannot speak you start to appreciate how important communication really is.*

Along similar lines, some students began to consider what information they gained through their cross-cultural communication experiences. These thoughts fell into the *Cultural Understanding* theme, characterized by reflections such as:

> *It is easy to travel through a country and think you understand their culture, but until I actually talked to the people, I had no idea what it was really like.*

Such awareness of cultural differences and how to learn about them is important for engineering students as they consider how best to work with and understand stakeholders on projects.

The responses in these themes reveal some reflection as students considered what information or insight they gained by going through the cross-cultural communication experience. At the same time, these students focused on the information they obtained rather than exploring their own feelings during the experience or how this new knowledge might influence their behavior in the future.

Category 4: Change of Perception. Two of the themes connect to essays where students revealed a deep level of reflection in considering the implications of their cross-cultural communication experiences. The *Empathy* theme, for example, captures situations where students compare their experiences with the challenges facing foreigners in the United States. One student put it this way:

> *I am not going to lie, before going to China, I had this snap judgement when I met people in America who did not know English who were trying their hardest to communicate what they wanted: wow, this person is very stupid. Why would they not understand _____? However, after getting tripped up by the differences in the culture and the absolute language barrier in China, I feel like I have so much more compassion for people in those types of situations.*

Similarly, essays within the *Self-Awareness* theme compared experiences abroad to experiences in the United States, but in these cases the students turned their reflections inward and critiqued attitudes they had previously held. For example, one student reflected on his perspective on the United States:

> *My attitude overall indicates I thought America and the English language are superior—leaving me with a sense of entitlement—and that is simply not true. These realizations, having left me humbled and apologetic, have increased my patience tenfold for non-native English speakers.*

Another student (on a different track) considered the implications of her experience for her perspective on foreigners in general:

> *This event made me realize that I had looked down my whole life upon people who were clearly not native to the United States who were confused by things and could only communicate their thoughts through broken fragments of sentences. I am grateful that my insolence for others in foreign situations was pointed out to me by this international experience.*

Although these themes were relatively rare within the essays, they indicate a deep level of reflection in which students questioned their prior behaviors and attitudes. These students saw broader implications from their experiences that could influence their perspectives on other people, on the United States as a country, and on themselves.

Discussion

Based on the results from the paired t-tests and repeated measures ANOVAs, we can say that students engaging in the RSAP course and international module experienced

increases in their cultural intelligence over the course of the program. All of the scales on the CQS had statistically significant increases from the pre-course to the post-course to the post-trip administrations. However, it is also important to consider the practical significance of these increases, which vary noticeably across scales. Because the CQS is a seven-point Likert scale, increases of 0.1 points do not provide much meaningful information, although they may be statistically significant. Items that increase by half a point or more, however, indicate a consistent increase in confidence across RSAP students in their knowledge of and ability to interact with other cultures. The effect sizes for our results reveal some variation in the strength of the growth in cultural intelligence at different points in the program.

The *Cognitive*, *Meta-Cognitive*, and *Behavioral* dimensions all saw practically significant growth over the length of RSAP, supported by large effect sizes. The *Cognitive* dimension, which includes items such as "I know the rules for expressing non-verbal behaviors in other cultures" and "I know the legal and economic systems of other cultures," exhibited the greatest gains. This is intuitive, given that much of the course focuses on gaining knowledge of other cultures and this is the easiest type of growth to facilitate in a traditional classroom setting. The *Meta-Cognitive* (e.g., "I am conscious of the cultural knowledge I apply to cross-cultural interactions") and *Behavioral* (e.g., "I change my verbal behavior when a cross-cultural interaction requires it") dimensions are nearly comparable, however, which may reflect the influence of the in-class activities and reflection exercises that are built into the course. The *Motivational* dimension is unique in its smaller effect sizes, but this is unsurprising given that this dimension had the highest scores on the pre-course CQS; a ceiling effect may explain why this scale did not move as much as the other scales. It is likely that students who choose to apply to the RSAP program already have a relatively high level of motivation to interact with other cultures, and the course does not target motivation as a specific learning outcome.

An important finding of this study is that the international module has a smaller practical influence on students' CQS scores than the course component of the RSAP program. Although all the dimensions show statistically significant growth from the post-course to post-trip administration, none of them increase by more than half a point on the Likert scale and they only achieve small or medium effect sizes. The *Cognitive* dimension once again showed the largest growth, which may reflect the short-term nature of the trip: it is easier to pick up facts in a short period of time than meta-cognitive or behavioral skills. The *Motivational* dimension is the only one with a larger increase after the trip than after the course, indicating that despite our best efforts to make the course exciting, traveling abroad is still a more convincing way to get students motivated to engage with other cultures. We have reason to believe that this motivational improvement helps students to understand the importance of the topics we cover during the course. In their post-trip reflections, students often look back on speakers and assignments from the course with

new respect for the ideas and challenges that were discussed. Thus, although we see less growth on the CQS as a result of the international module, we believe that combining it with the course improves other aspects of student learning.

There are several possible interpretations of the larger CQS growth experienced by students through the course as compared to the international module. Perhaps the trip on its own would have a larger effect if students had not already learned so much in the course and the scales experienced a ceiling effect. On the other hand, the study abroad literature suggests that pre-travel preparation results in greater learning, so perhaps the course starts the process of cultural learning and the international module solidifies student understanding. These results may indicate that cultural intelligence can be developed without traveling abroad, which would address several of the challenges associated with study abroad for engineering students. However, it may be harder to motivate students to take a course without the opportunity for an international experience. This reasoning is one motivation for combining the course with the international module, in addition to the opportunity the course provides for preparing students adequately for the trip as recommended in the study abroad literature.

The reflective essays reveal a more detailed picture of how students view their learning after both the RSAP course and international module. More than half of the students discussed a cross-cultural communication situation as a key learning moment in the program, suggesting that such experiences can lead to meaningful reflection and learning. However, there was significant variation in what students took away from these experiences. Although some students reflected on their own skills and attitudes, the majority remained at a relatively shallow level of reflection that focused on direct application of their learning. From this observation, we conclude that students may benefit from specific prompting to help them take a more reflective and personal view on what can be learned during RSAP. Recognizing the significance of cross-cultural communication experiences in students' minds, we can in the future provide more scaffolding to prepare students for these situations and reflect on them afterwards. For students who are unable to participate in RSAP or similar study abroad situations, these findings suggest that creating scenarios where speaking English is not an option may allow them to gain a meaningful cultural experience without leaving the country.

The qualitative results can be connected back to the conceptual framework of cultural intelligence and bring a new perspective on the quantitative analyses. The *Behavioral* dimension of the framework is initially apparent in student descriptions of their experiences trying to communicate with someone who does not speak English and the actions they took in those situations. For some students, figuring out what to do in such a situation was their main source of learning, as described by the Communication Skills theme. The Personal Skills theme reflects the *Motivational* dimension, as student self-

confidence plays a large role in their interest and confidence in engaging in cross-cultural situations. The *Cognitive* dimension is reflected in the Cultural Understanding theme, where students described cultural facts and observations. Finally, *Meta-Cognitive* development is indicated by those students who described having a Change of Perspective.

Although the *Cognitive* dimension was the largest area of growth in the quantitative results, *Behavioral* factors were discussed more often in the qualitative essays, which supports why our program collects multiple kinds of data. We can only speculate as to why this is, but it may be related to the difference between considering cultural situations theoretically (when taking a survey) versus being in a cultural situation in reality. It seems that when faced with an actual situation, it is easier for students to focus on "what did I do?" instead of "what did I observe?," "how did I change?," or "am I excited to do it again?" This finding may be connected to how comfortable students are with reflection, and their understanding of what kinds of questions to ask themselves. Future versions of this assignment will seek to address this concern by discussing reflective strategies with students explicitly and allowing them to practice reflection before going on the international modules. Since reflection is an important part of meaningful study abroad experiences, we believe enhanced focus on this skill will further assist in student development of cultural intelligence.

A final contribution of this paper is the confirmation that the CQS model is valid in our context. The original survey was developed based on data from undergraduate students in the United States and Singapore (Ang et al., 2007), but validating scales for particular settings when possible follows good practice (Gallagher & Brown, 2013). The results of our CFA revealed good fit between our data and the four dimensions that were identified in the original study with strong values for Cronbach's alpha for each scale (>0.7; Field et al., 2012). As the CQS is one of the few cultural intelligence instruments that is freely available for use, these results provide encouragement for others seeking to assess global engineering programs on a limited budget.

Conclusion

Overall, our results suggest that it is possible for students to develop cultural intelligence without traveling abroad. Although traditional longer-term study abroad experiences are valuable and can have significant impacts on participants (Vande Berg et al., 2009), they are not accessible for all students. Engineering students in particular face challenges transferring credit from foreign institutions and finding space in a tight schedule to spend an entire semester abroad (Parkinson, 2007). Courses like RSAP are one possible solution to these challenges, as it counts toward a necessary general education requirement while also helping students develop much-needed cultural intelligence. Achieving these results

do not happen easily, however; it is important to intentionally build any global experience (at home or abroad) with activities known to influence the development of cultural intelligence. The RSAP course includes opportunities for students to interact with people unlike themselves (Vande Berg et al., 2009), get outside of their comfort zones (Engberg et al., 2016), and reflect on their experiences (Kiely, 2005). Designing courses based on what is known about cultural intelligence development is an important step in making this kind of growth available to all students. We already know that study abroad experiences must be designed carefully for successful student learning (Vande Berg et al., 2009), and these same principles should be applied to domestic global education programs. As RSAP evolves, we will continue to adjust the course based on assessment results, student feedback, and future research that further explores what experiences and activities can help students develop cultural intelligence.

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Appendix A: Sample Syllabus for Global Engineering Practice Course

Global Engineering Practice: Leadership and Culture (2016 Syllabus)

Program Overview

The Rising Sophomore Abroad Program (RSAP) integrates an on-campus, semester-long experience with an international experience. The first part of the class will take place at Virginia Tech and is intended to provide students with strategies and background materials to ensure that time spent abroad will be meaningful and productive. The class will follow a seminar format with a lead faculty and guest lecturers. Students will have the opportunity to participate in applied learning through individual and team assignments. While traveling abroad, students will engage in local culture and customs during visits with engineering businesses and universities. RSAP provides students with an opportunity to expand their global competencies while learning about differences in political, technological, social, cultural, educational and environmental systems through experience. In total this experience constitutes 3 credit hours.

Learning Objectives

Students who successfully complete the course will be able to:
1. Define 'global engineer' and the skills needed to function successfully as an engineer in a range of different cultural settings.
2. Identify global challenges, technological problems, and business opportunities and their implications for American engineers.
3. Describe how differences in political, technological, social, educational and environmental contexts influence engineering practice.
4. Observe and appreciate cultural diversity and how culture impacts engineering in a global society.
5. Engage in a professional environment in an international location.

Course Assessment

In-Class activities and group work (10%, Due: ongoing)
We will have many opportunities for in-class activities to spur class engagement. Anytime this happens, please be sure to turn in your work (with your name included somewhere) before leaving class. Some days we will have electronic submission via Canvas, and other days we will have you turn in hard copies. Your total grade will be an average across all assignments based on the following scale: 3 points: good; 2 points: mediocre; 1 point: weak; 0 points: no work

Class Engagement via Twitter (5%, Due: account by 1/27; see schedule otherwise)

One of our challenges this semester will be to bring the world into our classroom and share what we learn with the broader community. For this assignment, you are all to create a professional Twitter account. If you'd like to use an existing personal account, that's perfectly fine. You are to help keep everyone informed throughout the semester by Tweeting news stories or web sites related to global engineering or the international module of the course. I expect you to be able to verbally summarize those articles to your classmates at the start of each class. We will continue to Tweet as a program throughout the semester and international segment of the class. Make sure you include @vtrsap in your Tweet; you will be expected to produce the following:

1. 3 article Tweets about engineering in a different country <u>during Module 1</u> (see schedule).
2. 1 Tweet tied to Mini Project 1 (see description) by <u>Feb 10 at 5 PM</u>.
3. 1 Tweet summarizing Communicate with a Professional conversation by <u>Mar 23 5 PM</u>.
4. 3 article Tweets related to your international track <u>during Module 3</u> (see schedule).

Get to know your fellow travelers (5%; Due: Slide: 1/25, Interview: 2/3)

You are to prepare a single power point slide describing who you are to your fellow classmates and the instructional team. This slide should be informative but communicate information in an effective, fun manner (Due by <u>MONDAY Jan 25 at 5 PM</u>). Using assigned prompts that we discuss in class, you are to interview one of your fellow travelers (Due by <u>Feb 3 at 5 PM</u>). Submissions will be compiled and uploaded onto Canvas for students to access.

Mini Project 1: Global Challenges (20%, Due in parts: 2/10, 2/24, 3/2 – See below)

Improved technology in transportation and telecommunications has made the world a more connected place. Through international collaborations, American engineers must be prepared to work with others from around the world to address problems and find solutions. We will explore some of the pressing issues that are affecting citizens from around the world. In addition, we will examine some of the political, technical, social, and environmental impacts on potential solutions.

Phase 1: Problem Identification (15%) - Each team will be assigned a country by Dr. Knight. Your team will begin an investigation into a problem that affects the people of that country. The list of potential problems is endless. Some examples include problems relating to energy, infrastructure, the environment, healthcare, and lifestyle.

Once your team has selected a problem, each team member should find an article from a high quality source (think back to ENGE1215) that summarizes the problem. The information you choose can address, but is not limited to:

- History of problem. How long has it been an issue? Has it been brought on by external factors?
- Scope of the problem. How many people are affected? It is specific to certain groups of people?

Each team member will Tweet out this article with a brief description using the hashtag #RSAPMP1 as well as @vtrsap by 5:00 p.m. on Wednesday, February 10. You should arrive to class prepared to summarize your article verbally for your team.

Phase 2: Solution Overview (50%) – Now that you have more of a background on your problem, your team will work to summarize the influences on its solution. As you discussed in ENGE1215, there are many global, economic, environmental, and societal influences on the design of a product. In addition, engineers must consider the local and regional regulations and any technological or societal limitations for a given solution. The following questions can guide your research:

- Who will pay for your solution? How will this money be raised?
- How will local laws and regulations impact your solution?
- Who will construct your solution? Who will use your final solution? Will they require training?
- Are there aesthetic or functional considerations based on local culture?
- What ethical considerations may you face in designing this solution?

As the deliverable for this phase, your team will develop an 11"x17" poster that contains information about your problem (from Phase 1) and your solution (Phase 2). Make your poster visually appealing. Include visual representations that help to deliver your points more effectively. Bring your team's printed poster to class on Wednesday, February 24.

Phase 3: Comparison Across Countries (35%) – Class on Wednesday, February 24, will consist of a "poster fair" of each teams' poster from Phase 2. Students will be expected to perform an evaluation of peers' posters and their teammates during that class session.

Following class, each student will prepare a 500-word max reflection on an interesting takeaway from the poster session. Your reflection should include, but is not limited to:
- Similarities and differences in problems across different countries.
- Similarities and differences in solution influences across different countries.

The reflection should be completed individually and submitted to Canvas by 5 PM on Wednesday, March 2.

<u>Mini Project 2: Working with a Global Team</u> (20%, Due in Parts: 3/30, 4/13 – See below)

Phase 1: Communicate with a Professional – Group & Individual (50%):

Part 1: (in class) You have just become managers of an international team of engineers. Work with your group to create a list of at least 7 questions that you could ask to learn about the cultural and business practices in the countries represented on the team.

Part 2: Each person in your group will be assigned a different country. Your job is to identify and communicate with a professional engineer from that country to discuss (at minimum) the questions your group identified in part 1. Suggestions for finding contacts will be presented in class, but reaching out to alumni is one option. You may email, Skype, call, or meet your contact, but be sure to take notes. You will turn in a 1-page summary of your conversation, Tweet a summary using the hashtag #RSAPMP1 as well as @vtrsap, and you will be asked to summarize your conversation verbally in class on <u>March 30</u>.

Phase 2: Managing a Team – Group (50%):

Part 3: (in class) Using the information gathered in the "communicate with a professional" activity, summarize similarities and differences across regions. Your group should turn in a visual representation of these comparisons (digital or hard copy). This could take the form of a table, a bubble map, Venn diagrams, or another format that makes sense to your group.

Part 4: Based on your findings in Part 3, what strategies will you employ as managers of the international team of engineers to ensure that your team works most effectively? The countries you were assigned in part 2 are all represented on your imaginary team. Your group should turn in a 2-page summary of three key strategies you would use with supporting examples from your conversations from part 2. <u>Due: April 13, 5 PM</u>.

<u>Mini Project 3: Semester Abroad Assignment</u> (20%, Due: 5/04)

You will work individually to identify a study abroad opportunity for an academic semester (not summer or winter programs). Please use the check sheet for your projected major as you plan this semester abroad.

You may use exchange programs from Virginia Tech, direct enroll at any institution who will accept you as a non-degree student for a semester, a Virginia Tech semester abroad

program, or use a third party provider to help arrange your semester at another university.

For information about ways to study abroad, go here:
http://www.globaleducation.vt.edu/index.cfm?FuseAction=Abroad.ViewLink&Parent_ID=CA55EEA2-E8B1-D428-5CE5ABA12D4DD176&Link_ID=80BEBFB7-A38F-9E92-80C6C043D8712CF8

You must provide the following information **for this study abroad opportunity** in a single document by <u>May 4 at 5:30 PM</u>. You may choose the format, but you MUST convert the information into a PDF file to upload into Canvas:

1. A 50-word explanation why you chose this study abroad opportunity.
2. Name of university with website link.
3. Semester and year planned for study abroad.
4. Type of semester abroad (exchange, direct enroll, etc) and name of sponsor (Virginia Tech exchange program, IES Abroad provider, etc).
5. Languages of instruction where you will study.
6. Explanation of the application process including links for information.
7. Information on lodging choice when abroad (home stay, dormitory, etc). You must provide linked information about your choice of lodging.
8. Attach a completed VT College of Engineering's transfer form: https://www.eng.vt.edu/sites/default/files/pageattachments/international-transfer-credit-evaluation-document.pdf
9. Link(s) to scholarships that you qualify for to study abroad or fund raising opportunities that you feel will work for you. Begin looking at these links: https://www.eng.vt.edu/international/undgraduate-scholarships and http://www.globalinksabroad.org/fund_my_study_abroad/
10. Cost estimate including tuition costs, fees, lodging, transportation, passport and visa fees, spending money, etc.
11. If you will require a visa, provide the link for information to apply for a visa to study abroad from the embassy's website.

You may consult the VT Global Education office (www.globaleducation.vt.edu), the Office of Global Engineering Engagement and Research (GEER, http://www.eng.vt.edu/international), or third party study abroad providers. Feel free to meet with the academic advisors in your projected VT major as well.

Here is a list of possible third party providers:
IES Abroad: http://www.iesabroad.org; AIFS: http://www.aifsabroad.com; ISEP: http://www.isep.org/ (special provider for VT); CIS Abroad: www.**cisabroad**.com; Semester at Sea: http://info.seamester.com; CIEE Study Abroad: http://start.ciee.org

Final Reflections (20%, Due: 6/30)

Meaningful reflection is an essential part of the learning process. This final assignment is in two parts: Part 1 should be completed while you are abroad, and Part 2 should be completed once you are back in the United States.

Part 1: You should keep a daily journal during your trip that you will turn in once we return. It is your decision to hand write entries, use technology, or a combination of both. Once we return, you should upload your journals to Canvas; if you hand write entries, please scan your reflections so you can keep your journals for yourselves. Your journal should begin when we arrive at the airport and end upon your return to the airport. Each day please make sure to address **each** of the following:
- What did you do?
- What did you see?
- What did you learn?

In addition to addressing these questions, make connections between your daily experiences and how they may help your development as an engineer. Your observations can be comparative (e.g., how the country is the same or different from the U.S.) and can include comments on daily life, anecdotes, language, politics, geography, stores, social life, the popular culture of the country, etc.

While you are traveling, you will also receive specific reflective prompts that you should address in your journal. Make sure these are identified clearly.

Part 2: Once you return to the United States, you are to write one 1,000-word essay. Pretend you are in an interview situation for an internship. Respond to my following interview questions:

> I see you participated in an international experience. That's very unusual for a first year engineer and is fantastic that you were selected for this program.
> - What new knowledge or skills did you learn or build upon while you were abroad?
> - What specific examples from the in-semester class or international module helped you develop those skills?
> - How can the RSAP international experience be a value-add for my company/organization?

COURSE CALENDAR FOR SPRING 2016

Date	Topic
Module 1: Global Challenges	
Jan-20	Course Overview, Policies, and Expectations; Course Assessments, Introductions, and Logistics Discussion
Jan-27	Introduction to Global Challenges – Olympic Games In-Class Activity
Feb-3	Systems Thinking
Feb-10	Applying Technical Solutions to Global Problems (sub-Saharan Africa) – *Speaker from Political Science Department*
Feb-17	How the World Works – *Speaker from Political Science Department*
Feb-24	Global Challenges Poster Session: Mini Project 1
Module 2: Global Communication	
Mar-2	Working on an International Team – *Two Speakers from Industry*
Mar-09	NO CLASS – SPRING BREAK
Mar-16	Us versus Them: Tapping into the Power of Difference – *Speaker from Department of Agricultural Leadership*
Mar-23	Interdisciplinarity in Central and South America – *Speaker from Industry*
Mar-30	Introduction to World Politics – *Speaker from the International Studies Department*
Apr-6	Leadership Abroad – *Speaker from the US Army*
Module 3: International Preparation	
Apr-13	Visit from Global Education Office
Apr-20	Cultural Preparation – *Speakers from Foreign Language Departments*
Apr-27	Cultural Preparation – *Speakers from track countries*
May-4	Travel Preparation – RSAP Alumni Panel

Appendix B: Sample Schedule for RSAP Summer 2017 China Seminar

RSAP Summer 2017 China Seminar
Beijing 北京 | Shanghai 上海 | Hangzhou 杭州

Each year, CLI partners with a select number of universities around the world to create one-of-a-kind, fully customizable study experiences in China. With careful guidance from CLI's team of Western and Chinese educators (see www.studycli.org/team), Virginia Tech RSAP students will gain invaluable insight into China's cultural heritage and modern ascension.

CLI provides three core services: (1) assistance in developing your program itinerary; (2) comprehensive pre-departure assistance (see www.studycli.org/rsap2017); and (3) facilitation of all logistical provisions (e.g., domestic and international airfare, buses, hotel accommodations, restaurant recommendations and bookings, activity planning, and Chinese and American CLI program leaders). Please feel free to contact us anytime if you have questions, requests, and/or suggestions during the program planning and implementation process.

Our team looks forward to welcoming Virginia Tech RSAP to China in 2017!

MAY 14 - MAY 21: BEIJING | EXPLORATION OF CHINA'S CULTURAL HERITAGE

During the Beijing portion of the RSAP China Seminar, students will be immersed in Chinese culture and history in the PRC's capital city. Important historical sites will be visited and students will discover the city in a variety of unique ways, including through interactive games and dialogue with locals.

DAY 1 | SUNDAY, MAY 14 *(WASHINGTON DULLES TO BEIJING)*

All Day
Fly nonstop from Washington Dulles (IAD) to Beijing (PEK) on UA 807
- Depart Dulles at 12:25 PM, arrive Beijing at 2:20 PM the next day

DAY 2 | MONDAY, MAY 15 *(BEIJING)*

02:20 PM Arrive in Beijing and check into Beijing Heyuan
06:00 PM Welcome to China! Enjoy a welcome dinner at a famed Peking Duck restaurant

DAY 3 | TUESDAY, MAY 16 *(BEIJING)*

08:00 AM Breakfast daily at hotel throughout program
09:00 AM Explore Tiananmen Square and the Forbidden City
11:00 AM Tour a Qing Dynasty-era hutong on rickshaws and by foot
- Enjoy a group lunch with a local family, ascend the Beijing Drum Tower, and relax near Houhai
06:00 PM Group dinner at a Xinjiang Uyghur restaurant
Xinjiang is China's largest province , home to China's greatest wealth of natural resources, and engrossed in one of China's most controversial separatist movements.

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RSAP Summer 2017 China Seminar

BEIJING 北京 | SHANGHAI 上海 | HANGZHOU 杭州

DAY 4 | WEDNESDAY, MAY 17 *(BEIJING)*

09:00 AM	Visit Tsinghua University's Science Park, Tuspark (includes group lunch)
	TusPark was launched by the prestigious Tsinghua University's technology department. It is often referred to as China's Silicon Valley and houses many of China's most promising high-tech startups.
01:00 PM	Explore the Summer Palace
06:00 PM	Group dinner at Haidilao Hot Pot Restaurant with local peers

DAY 5 | THURSDAY, MAY 18 *(BEIJING)*

09:00 AM	Explore the 2008 Beijing Olympic park *(optional)*
05:00 PM	Visit the headquarters of Amazon China
07:00 PM	Free time to explore Beijing and small group dinners on your own

DAY 6 | FRIDAY, MAY 19 *(BEIJING)*

09:00 AM	Visit the Lama Temple and Confucius Temple
01:00 PM	Shopping and small group dinners on your own in Wangfujing
05:00 PM	Attend a guest lecture on "Sino-American Politics and Culture" at the Beijing Foreign Language University

DAY 7 | SATURDAY, MAY 20 *(BEIJING)*

09:00 AM	Guest lecture at Heyuan about one of China's Largest Construction Companies
12:00 PM	Group lunch near the Great Wall
03:00 PM	Visit the Great Wall of China at Mutianyu
06:00 PM	Small group dinners on your own in Nanluoguxiang

MAY 21 - MAY 27: SHANGHAI | INTRODUCTION TO CHINA'S MODERN ASCENSION

During the Shanghai portion of the Virginia Tech RSAP China Seminar, students will be introduced to China's modern ascension by visiting local and multinational firms, attending a guest lecture at Fudan University, engaging in direct interaction with local peers, and more.

DAY 8 | SUNDAY, MAY 21 *(BEIJING TO SHANGHAI)*

06:30 AM	Leave hotel to fly to Shanghai (flight CA 1501)
	● Depart Beijing (PEK) at 8:30 AM; arrive Shanghai (SHA) at 10:40 AM
12:00 PM	Check into the Jinjiang Inn Shanghai Huaihai East Road; group lunch
01:00 PM	City tour of Shanghai, China's economic capital
	● Take ferry across the Huangpu River to Pudong, ascend the Shanghai World Financial Center, and visit Apple's flagship store in China
06:00 PM	Group dinner on the Bund and guided tour

RSAP Summer 2017 China Seminar
BEIJING 北京 | SHANGHAI 上海 | HANGZHOU 杭州

DAY 9 | MONDAY, MAY 22 *(SHANGHAI)*

09:00 AM	Visit the GE Global Research Center in Shanghai
	Students will learn about the latest research conducted at the facility, explore its labs, and talk to employees in charge of running various technology programs that range from water purification systems to renewable energy design.
12:00 PM	Group lunch
01:00 PM	Visit the Shanghai Urban Planning Exhibition Center
	Understand the sheer scale of Shanghai by viewing a large-scale model of the entirety of urban Shanghai, showing existing buildings and approved future structures.
06:00 PM	Boat cruise and group dinner on the Huangpu River

DAY 10 | TUESDAY, MAY 23 *(SHANGHAI)*

12:00 PM	Visit Yuyuan Garden; free time in Old Town Shanghai for small group lunches
04:00 PM	Explore the Propaganda Poster Art Centre and tour the French Concession
	The Propaganda Poster Art Centre is one of a kind. The Mao-era propaganda collection has been assembled over the past 20-plus years by Mr. Yang Pei Ming and perhaps the world's most extensive.
06:00 PM	Group dinner followed by the world famous Shanghai Acrobatic Show

DAY 11 | WEDNESDAY, MAY 24 *(DAY TRIP TO HANGZHOU)*

08:30 AM	Bullet train to Hangzhou
	Hangzhou is famed throughout China for its natural beauty and entrepreneurial spirit. China's largest and most well-known Internet company, Alibaba, was founded and is headquartered in Hangzhou. The city's urban population now exceeds 7 million. RSAP students, faculty leaders, and CLI group leaders will take a 50-minute bullet train ride from the Shanghai Hongqiao station direct to Hangzhou East to commence a full day of exploration and learning.
11:00 AM	Learn Taiji Quan alongside West Lake with a local Taiji master
	Taiji Quan, often spelled Tai Chi in the West, is a Chinese martial art practiced for both its defense training and long-term health benefits.
12:00 PM	Group lunch
01:30 - 2:00 PM	Company visit to Sino-Ocean Group
	Sino-Ocean is a real estate investment company. Students will attend a talk and Q&A with a local manager, followed by a tour of their construction site.
05:00 PM	Small group dinners and shopping on Hefang Street; bullet train to Shanghai

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Day 12 | Thursday, May 25 *(Shanghai)*

09:00 AM	Explore the inner-workings of Volkswagen's Shanghai factory
12:00 PM	Group lunch
02:00 PM	Site visit to the Shanghai Baowu Steel Factory

Baowu Steel, is a state-owned iron headquartered in the Baosteel Tower in Shanghai's modern Pudong District. According to World Steel Association, Baowu is the fifth-largest steel producer in the world measured by crude steel output, with an annual output of around 35 million tons.

06:00 PM	Guest lecture and case study on the Shanghai Disney Resort
08:00 PM	Group dinner

Day 13 | Friday, May 26 *(Shanghai Disney Resort)*

Morning/Afternoon	Enjoy the Wonderful World of Disney during a day trip to Shanghai Disney!
07:00 PM	Program farewell dinner with faculty, local friends and CLI program leaders

Day 14 | Saturday, May 27 *(Shanghai to Washington Dulles)*

Morning	Transfer to Shanghai Pudong Airport and fly back to USA

- Depart Shanghai Pudong (PVG) at 12:10 PM on UA 858
- Arrive San Francisco (SFO) at 8:40 AM
- Depart San Francisco (SFO) at 10:55 AM on UA 309
- Arrive Washington Dulles (IAD) on May 27 (same day) at 7:01 PM

Appendix C: Cultural Intelligence Scale (CQS) Items

Table A1. Cultural Intelligence Inventory Items from Ang et al. (2007)

Item #	Dimension	Item Text
CQS1	Cognitive	I know the rules (e.g., grammar) of other languages.
CQS2	Cognitive	I know the religious beliefs of other cultures.
CQS3	Cognitive	I know the marriage systems of other cultures.
CQS4	Cognitive	I know the rules for expressing non-verbal behaviors in other cultures.
CQS5	Cognitive	I know the legal and economic systems of other cultures.
CQS6	Cognitive	I know the arts and crafts of other cultures.
CQS7	Meta-Cognitive	I am conscious of the cultural knowledge I apply to cross-cultural interactions.
CQS8	Meta-Cognitive	I check the accuracy of my cultural knowledge as I interact with people from different cultures.
CQS9	Meta-Cognitive	I am conscious of the cultural knowledge I use when interacting with people with different cultural backgrounds.
CQS10	Meta-Cognitive	I adjust my cultural knowledge as I interact with people from a culture that is unfamiliar to me.
CQS11	Behavioral	I alter my facial expressions when a cross-cultural interaction requires it.
CQS12	Behavioral	I change my verbal behavior when a cross-cultural interaction requires it.
CQS13	Behavioral	I change my non-verbal behavior when a cross-cultural situation requires it.
CQS14	Behavioral	I use pause and silence differently to suit different cross-cultural situations.
CQS15	Behavioral	I vary the rate of my speaking when a cross-cultural situation requires it.
CQS16	Motivational	I enjoy living in cultures that are unfamiliar to me.
CQS17	Motivational	I am confident that I can socialize with locals in a culture that is unfamiliar to me.
CQS18	Motivational	I am confident that I can get accustomed to the life style in a different culture.
CQS19	Motivational	I enjoy interacting with people from different cultures.
CQS20	Motivational	I am sure I can deal with the stresses of adjusting to a culture that is new to me.