Designing Short-Term Study Abroad Engineering Experiences to Achieve Global Competencies

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(Student Development Track)

International experiences for engineering students are rapidly becoming more common. While many factors are driving this change, one key factor is the growth of short-term study abroad experiences that do not interfere with the typically constrained schedule of engineering students.

This paper compares the assessment of student learning outcomes associated with two engineering short-term study abroad courses, one taught in Argentina and one taught in Panama. The two courses are structured differently in both content and pedagogy, and each contains a set of course-specific learning objectives. However, both also share our University's set of Global Competency Outcomes (GCOs).

The Argentina program is an interdisciplinary project-based class. Students work in teams on projects at wineries in Mendoza, Argentina. Students from all disciplines are invited to apply, with engineering and undergraduate business students being the two largest groups. Most "class time" is spent either at the client sites or working within their project team. Faculty take the role of mentors and coaches, advising students as they progress through their projects. The projects are diverse, including manufacturing operations, sales, logistics, and tourism. Most projects result in the team delivering recommendations, decision support tools, or information systems to the clients. The final deliverables are both client-focused: a report and a briefing.

The Panama program focuses on the history and modern impact of the Panama Canal. The course uses field trips to key locations, interactions with Canal engineers, construction site visits, and lengthy discussion and deliberation to explore the complicated and rich history of the Canal as a sociotechnical system. Readings from both popular culture and the scholarly literature illuminate key issues and stimulate wide-ranging discussions of politics, economics, race, culture, equity, and justice. Students write multiple papers including a final integrative essay that expresses the full breadth of the course's impact on them, both academically and personally.

The GCOs defined by our University fall into five broad categories: *knowledge* and development of a global frame of reference; *attitude* toward cultural differences; *attitude* toward personal growth; *skills* concerning communication, adaptation, and interaction across cultures; *action* in seeking out opportunities for engagement. Each of these categories has specific learning outcomes underneath them, as well as suggested evaluation strategies.

This paper describes how each program was structured differently to address the GCOs, giving specific instances of how these learning outcomes are targeted with course experiences and how they are assessed. Assessment of student achievement of the GCOs is compared between the programs. This comparison shows multiple paths to reaching GCOs in short-term study abroad courses and also reveals insights as to the relative strengths of the different structures of the two programs.

Introduction

Engineering study abroad programs take many forms, including traditional student attendance at foreign institutions, international co-op working assignments, and service learning experiences. And the experiences are generally agrees to be meaningful and valuable for students, especially when such experiences are constructed with care and according to both educational and study abroad best practices[1]. Indeed, engineering practice and ABET accreditation[2] both recognize the value of global perspectives, whether imparted in traditional classrooms or via study abroad experiences[3]. The taxonomy of study abroad experiences presented by Parkinson[4] is helpful in understanding the diversity of approaches to this crucial undergraduate experience. The rise of short-term study abroad experiences, including both January-terms and Maymester, coalesces well with the typical engineering course schedule[5]. Typical obstacles to during-the-semester study abroad include course scheduling and availability constraints, both of which evaporate in the short-term format in January or May. This is attractive to many engineering students, who can earn course credit for a dedicated, if intense, experience, and meanwhile manage their course enrollment during the spring or fall semester to control workload and promote their academic success.

There is considerable discussion in the literature about the merits of short and longer-term study abroad experiences. These differences largely relate to the level of immersion students experience while taking the course, the authenticity of their interactions with local people at the location of the course, and of course cost to students and parents. And there is evidence that longer-duration programs achieve better academic and global/cultural competency outcomes than shorter programs[6]. Comparative programs (with very short-term experiences of just a few days in each port) include Semester at Sea, for example, in which the ship is at sea for an entire semester with short-duration stops in various ports[7]. Long-term engagements could include a semester in residence at a foreign institution or doing an international work assignment. Short-term programs, such as those described here, spend fewer than weeks in a location, engage more deeply with the culture, and have the opportunity to experience the type of serendipitous interactions that can impart so much richness to the overall experience. The IIE Open Doors Report for 2012 indicates that nearly 60% of US students who study abroad engage in short-term programs[8] (define by IIE as Summer, January term, or less than 8 weeks during the school year).

This paper compares two engineering study abroad experiences in Spanish-speaking countries, both with a two-week duration. We frame the discussion in terms of both course learning objectives and our university's set of Global Competency Outcomes (GCOs). We consider the entire student lifecycle of engagement with these study abroad programs, and highlight the differences in the programs from pre-departure through return. Both classes achieve the course objectives and GCOs, but they do so using very different course structures and different types of evaluation instruments. This paper summarizes our experience with these two courses and compares/contrasts the two program formats and assessments.

University Global Competency Outcomes

Several years ago, our university convened a task force to develop a set of Global Competency Outcomes (GCOs). In 2010, the task force report was delivered and approved by the Provost and the Board, and the resulting framework for development, improvement, and evaluation of study abroad experiences has been widely adopted as the set of "best practices" at our university,

although they are not specifically calibrated for engineering students[9]. In brief, the resulting GCOs focus on five broad educational outcomes falling into four basic classes (knowledge, skill, attitude about self and culture, and action):

1. Students apply their knowledge to create a global frame of reference in the response to situations and events (knowledge).
2. Students understand, respect, and appreciate cultural differences (attitude about culture).
3. Students demonstrate understanding of themselves and their ability to cope and adapt (attitude about self).
4. Students apply their knowledge of intercultural communication to adapt to a different culture and to interact effectively with those from a different culture or cultural background (skill).
5. Students seek out opportunities to engage (action).

Each of the GCOs has several explicit sub-goals (a), (b), (c), etc. as described more completely in Appendix A. Moreover, our university suggests that these GCOs be assessed using a collection of quantitative and qualitative means, including surveys, focus groups, interviews, open-ended individual discussion, journaling, reflective essays, and the like.

The GCOs are especially relevant to engineering education and practice because modern engineering is a globalized profession. Exposing engineering students to new situations, cultural contexts, customs and communication practices, and ways of living and doing business contributes to their preparation as professionals and their development as people. For instance, GCO 1(a) ("students demonstrate knowledge of interconnectedness/interdependence of political, environmental, social, and economic systems on a global scale and in historical context") arguably targets the essence of engineering practice in a globalized world. GCOs 3(c) and 4(d) engage students in retaining "composure and equanimity when they don't have information to cope with uncertainty (tolerance for ambiguity)" and coping "with frustration, adversity, or challenging circumstances (resilience)", both of which once again express the great challenges of practicing engineering in a global context. While the GCOs are written for the entire university and all its disciplines, it is clear that many of them have a special resonance for engineering education and practice.

Pre-Departure Planning and the Beginning of the S.A. Experience

The student lifecycle for study abroad experiences at our university takes the following format. In brief, students are introduced to available programs via advertisements, flyers, study abroad fairs, email messages, and word of mouth. Students then apply to their desired program through the International Studies Office (ISO), applications are reviewed by faculty Program Directors (PDs), and a final selection of students for each program is made. The administrative details of this process are not exceptionally important, but some of the program details are. In this section, we review the key elements of this pre-departure process that support the study abroad learning outcomes.

For each academic program, exposure to the study abroad learning outcomes begins when students read the syllabus and decide to apply to the program. Once students are selected for the program, a pre-departure program typically includes several features covered at in-person meetings or asynchronously as appropriate:

- *a "content" pre-departure experience*: usually done face-to-face, the content pre-departure experience engages students on the course content, and more specifically on why the course content is best explored via a study abroad experience. The academic learning outcomes are described and the class deliverables and expectations are discussed.
- *a cultural pre-departure experience*: also usually done face-to-face, the cultural pre-departure experience explores the culture in which the students will be immersed and prepares students for the language expectations, cultural norms, and local practices that they will confront during their study abroad experience. Behavioral expectations in general, and specifically as they relate to local customs, are discussed in detail.
- *a logistical pre-departure experience*: also usually done face-to-face, the logistical elements of the trip including travel details, airports, hotel information, and in-country transportation arrangements are all discussed. Safety issues and emergency response plans are covered, and students are introduced to resources about the destination, US embassy information, police and safety issues, currency exchange, etc.
- *reading materials*: students are also given reading assignments to complete before arriving in country for their study abroad experience. The readings might be books, journal papers, newspaper or magazine articles, or other resources. These reading materials may be related to either the course content or the destination, or both.

It is crucial to set expectations for academic and personal conduct as early as possible, and to emphasize that the pre-departure activities exist as the first element on the continuum of the program lifecycle. Each study abroad program consists of students with varying levels of travel history and sophistication, ranging from well-seasoned international travelers to students who may have barely traveled outside their home state. Each faculty PD must emphasize that sophisticated travelers will still have much to learn, and that novice travelers need not be afraid or intimidated.

For the **Argentina program**, students attend a total of four to six hours of pre-departure face-to-face meetings, typically in 2 hour blocks. The first session focuses on community building, a game-show style quiz that introduces key aspects of the program and Argentina to students, and a business case focused on the wine industry. Students present short presentations of key chapters from *Argentina- Culture Smart!: A Quick Guide to Customs and Culture*[10] during the second session. While the second session is squarely focused on cultural issues, the third session is centered on content. In this final session, students work on teams to complete a systems engineering case study based on a prior project from the Argentina program. We dedicate 15-30 minutes to logistics at each meeting as necessary. In addition, we typically hold one optional outing to a local winery due to our working with wineries in Argentina as part of the program.

In the case of the **Panama program**, students attend two pre-departure, face-to-face meeting of total duration about 2 hours that seek to introduce students to each other, and to begin building community among them. Students are introduced to the course content and the rhythm of the course in terms of how and where the material will be taught and learned. The Panama program has fairly traditional class deliverables: individual papers, discussion, group research papers and presentations. The cultural and logistical portions of the face-to-face pre-departure meetings specifically discuss the American imperial history in Panama, the reasons why Panamanian culture is still strongly influence by American culture (using the US dollar as official currency, for example), and how US civic institutions continue to play a prominent role in Panamanian

life. Because the Panama course is built around the canal as a sociotechnical system, students are required to read *Panama Fever*[11] (a brisk and readable history of Canal construction) before they arrive in Panama.

Program Curricula and Structure

Argentina Program Structure

The heart of the Argentina program is a set of 2-week projects that teams of students complete for wineries in Mendoza, Argentina. We view ourselves as a company, with the two instructors being managing partners and the students being technical and business consultants. All learning occurs in the context of these projects with no time spent in a traditional classroom setting. Faculty leading the program are from systems engineering and from business, with four faculty having taught in the program; students predominantly are from these two divisions, also. That said, the program is open to all undergraduates at our university and there are always students from other majors among our sixteen to twenty total students. Logistically, we work closely with partners in Mendoza to establish clients for projects and arrange logistical details like housing and ground transportation.

The Argentina class has the following learning objectives. During the course, students should:

1. Demonstrate an understanding of, respect for, and appreciation of cultural differences.
2. Be able to explain differences between U.S. and Argentine cultures with respect to engineering and business.
3. Demonstrate an ability to integrate knowledge of Argentine culture into their interactions with people and creation of client deliverables.
4. Demonstrate an ability to cope and adapt with unfamiliar situations.
5. Seek out opportunities for engagement with Argentine culture.

After taking this course, students should be able to:
6. Conduct industry and SWOT analyses.
7. Identify customer needs through a variety of methods including interviews, surveys, focus groups, and action research.
8. Develop overall goals and performance metrics for a system.
9. Work with clients to obtain necessary data and information.
10. Generate and evaluate alternative solutions to a problem.
11. Deliver effective oral presentations to clients.
12. Write effective technical reports for clients.

These learning objectives are mapped to the GCOs as shown in Table 1. In addition, an overview of how each learning objective is measured is shown in the table.

Table 1.   Argentina Program Mapping of Learning Objectives to Global Competency Outcomes

		Course Learning Objective											
		1	2	3	4	5	6	7	8	9	10	11	12
GCO	1 – knowledge												
	2 – attitudes (cultural differences)	✓	✓										
	3 – attitudes (adapt/cope)				✓	✓		✓		✓			
	4 – skills (communication)			✓				✓		✓		✓	✓
	5 – action (engaging with other culture)						✓		✓		✓		
Program Activities	Pre-departure, readings		✓				✓		✓				
	City orientation			✓		✓							
	Ex-Pat speaker panel	✓	✓	✓									
	Client interactions	✓	✓	✓	✓	✓		✓	✓	✓	✓		
	Work off client site						✓				✓		
	Free days, excursions	✓		✓	✓	✓							
	Group Meals	✓		✓		✓							
	Final Written Report	✓		✓									✓
	Oral Client Briefing	✓		✓	✓							✓	
Measured how?	Reflection in journal	✓	✓	✓	✓	✓							
	Instructor Observation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Final essay	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓
	Client deliverables			✓			✓	✓	✓		✓	✓	✓

A key takeaway from Table 1 is that putting students in situations where they directly interact with people living in Argentina is central to the program, and that direct instructor observation and student written documents form the majority of assessment activities. The rationale is that students learn best through doing and that authentic cultural challenges to which the students must adapt are a primary way to achieve "learning through doing" for global competency.   This is why the learning objectives for this class cannot be achieved by working with industry within the United States. Client interactions are especially important as situations in which students interact with Argentines in a professional environment. Excursions and free time when students explore the city are also important opportunities for students to directly interface with the Argentina culture.

Panama Program Structure

The Panama class takes place entirely on the ground in Panama, mostly in and around Panama City (located on the Pacific side of Panama).   The history of Panama and the canal as a key economic and political location from 1500-present is told at various locations around the city that provide context for these periods in history. Class meetings are held in specific locations around the city, and the class engages with local experts where possible to discuss the historical and engineering context for developments in Panama. The class meets with engineering faculty and students from the Universidad Tecnologica de Panama (UTP), as well as engineers from the Canal de Panama (the governing authority for the canal and the expansion project). We also

hold class at the Ciudad del Saber (the "City of Knowledge"), a former US Army installation (Fort Clayton) in Panama City that is now the intellectual hub of Panama, housing academic organizations, NGOs, start-up companies, and the like.

Each day, the class travels to a different location to experience the feeling and people of that location, and we have a lecture and discussion based upon assigned reading. For instance, when we talk about American imperialism in the period 1914-1999, we hold class at the City of Knowledge, literally inside a 300-acre former US Army base. Students feel the institutional culture, they see the architecture and layout of the campus, and they get a sense of the incredible power and influence wielded by the US in Panama during that time period (there were actually dozens of such bases in the country). When we discuss the tragic events of Martyr's Day (a national holiday, January 9), we teach class at Balboa High School which was literally the scene of the massacre of 19 Panamanian students. We teach class in one of the classrooms in the school, then we walk outside to view the eternal flame memorial to the fallen students. And of course when we talk about the Canal Expansion Project, we visit active construction sites with Canal de Panama engineers. Visiting the project with the engineers and seeing the work up close frames our discussion of the engineering, economic, political, and environmental aspects of the expansion project.

The Panama class has the following academic learning objectives. After taking this course, students will be able to:

1. Describe the historical context for the construction of the canal, from the Spanish to the French to the Americans, and comparatively assess the reasons behind the French failure and the American success in building the canal.
    1(a).   identify, compare, and contrast the individual motivations for presence on the isthmus by the Spanish, French, and Americans
    1(b).   articulate the key failures of the French effort in all dimensions (engineering, cultural, economic, political, etc.)
    1(c).   compare the American brand of imperialism with the French brand, and explain why the American effort to build the canal succeeded
2. Construct an argument about American imperialism in Panama in the period 1904-1999, and describe the objectives (both positive and negative) of the American occupation of Panama.
    2(a).   describe the historical context and on-going differences in treatment of workers from different racial and ethnic backgrounds during this period
    2(b).   identify elements of current Panamanian culture that are the direct result of American imperialism and/or the history of labor migration to support canal construction and operation
    2(c).   explain why the US eventually decided to end its imperialist operation in Panama, and what the costs and benefits of this action (political, cultural, economic, etc.) were to both the US and Panama

3. Synthesize historical perspectives and current operational realities of the Canal into an understanding of the necessity for an expanded canal, its impact on global trade, and its susceptibility to competing transit routes.

    3(a). understand the on-going global significance of the canal, including its political, cultural, and economic impact on both importers and exporters

    3(b). articulate the importance of the Equator Principles as a shared international framework for financing large-scale infrastructure projects while respecting environmental concerns

    3(c). evaluate the history and future of canal neutrality, and its impact on international relations and global shipping

The GCOs and course learning objectives are not orthogonal and can in fact be mapped onto each other as shown in Table 2. In addition, each GCO can be evaluated using one or more of the evaluation approaches listed on the table: reflection, observation, essay, or discussion. Clearly not all GCOs are targeted for every study abroad experience, nor are all GCOs for a given course and the course learning objectives fully mapped to each other. However, *the table does emphasize that course learning objectives can and should be written, where possible, to target specific GCOs*. In addition, specific evaluation instruments should be identified at the outset to measure students' GCO achievement, just as instructors establish assessment instruments for course learning objectives that might take the form of class discussion/participation, submission of homework or writing assignments, quizzes, exams, and the like.

Table 2. Mapping of GCOs to course learning objectives, and assessment approaches for each GCO, for the Panama course.

		Course Learning Objectives								
		1(a)	1(b)	1(c)	2(a)	2(b)	2(c)	3(a)	3(b)	3(c)
GCO	1 – knowledge	✓	✓				✓	✓	✓	✓
	2 – attitudes (cultural differences)			✓	✓	✓				
	3 – attitudes (adapt/cope)				✓	✓				
	4 – skills (communication)							✓	✓	✓
	5 – action (engaging with other culture)				✓	✓	✓	✓	✓	✓
Program Activities	Pre-departure, readings	✓	✓	✓						
	City site visits/lectures	✓	✓	✓		✓		✓		
	Meet w Panamanian fac.							✓	✓	✓
	Meet w Panamanian stud.							✓	✓	✓
	Visit Canal w engineers		✓				✓	✓	✓	✓
	Free days, excursions				✓	✓		✓		
	Group Meals			✓		✓		✓		
	Final Written Report	✓		✓	✓	✓		✓	✓	✓
	Final reflective essay	✓	✓	✓	✓	✓	✓	✓	✓	✓
Measured how?	Reflection in journal	✓	✓	✓	✓	✓	✓			
	Instructor Observation	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Final reports/essays	✓	✓	✓	✓	✓	✓	✓		✓
	Class Discussion	✓	✓	✓	✓	✓	✓	✓	✓	✓

Comparing the Programs' Structures

In Table 3, the two programs are compared on several key attributes.

Table 3.   Comparison of the Programs.

	Argentina	Panama
Duration	2 weeks	2 weeks
Timing	January and May	January
Pre-departure	6 hours	2 hours
Number of instructors	2	1 plus TA
Logistical coordination	Handled by contacts on site	Handled by instructor
Content focus	Systems engineering and business; *Gaining project-based experience doing* engineering and business in Argentina.	Technology and Society; *Gaining knowledge* about how social and cultural forces shaped and continue to shape the Panama canal and vice versa.
Global Competency Outcomes focus	GCO 3, 4, and 5b Which are focused on attitudes (coping and adapting to difficult situations resulting from being in a different culture), skills (communication), and seeking direct engagement with Argentina culture	GCO 1, 2 and 5a Which are focused on knowledge (creating a global frame of reference), attitudes (appreciating and respecting cultural differences), and seeking knowledge and different perspectives on global issues
Course activities most strongly linked to learning objectives (do you mean GCOs?)	Anything that involves direct interaction and communication with local Argentines, e.g., client interactions, oral briefings, excursions, ex-pat panel discussion	Holding class in different locations that emphasize the strong influence of outside cultures on Panamanian society and institutions today

The similarities shown in Table 3 are that these are two-week engineering programs in Latin America. While several differences are shown, the key ones are content focus, GCO focus, and which course activities are most central to reaching the learning objectives. The Argentina program has a more technical focus and is linked more strongly to GCOs and activities related to engaging students in situations where they must communicate with Argentines and learn to adapt to a different culture. The Panama program, on the other hand, is focused more on the two-way relationship between technology and society and is linked more strongly to GCOs and activities that directly engage students with opportunities to gain the knowledge necessary to understand, respect, and appreciate cultural forces that have driven and are driving a world-impacting engineering project. For the Panama program, there is no client-based interaction *per se,* and it therefore targets GCOs 3 and 4 somewhat more weakly than the Argentina program.

Program Learning Objectives Assessment

Assessment of both programs starts with the mapping of learning objectives and GCO's to course activities and other measurement instruments. These are shown in Tables 1 and 2 for each program. We emphasize that instructor observation of students is a key assessment instrument for both classes. Such direct observation is not possible for classes that occur on a campus due to the large number of students and the lack of time that instructors spend with students. The intensity of the shared experience in which faculty and students live and learn together in community, with essentially no outside distractions or competition for their time and attention, is a crucial element of these short-term study abroad programs. A key distinction between typical on-campus classes and these two programs is that in these two study abroad

programs, faculty work more closely and for more hours with each student. This distinction increases the relevance and validity of instructor observations in evaluating learning, and presents tremendous opportunities for students to engage in authentic individualized learning experiences. Moreover, students are continuously—essentially daily, sometimes hourly-- receiving feedback from the instructors about their performance in class. The affordances of the study abroad environment are all encapsulated in this short time constant for individualized student feedback.

In this remainder of this section, samples of the assessment are shown from each program.

Argentina Program Assessment

The Argentina program relies nearly entirely on qualitative analysis of course artifacts and direct instructor observation. While a *program evaluation* survey is completed by all students, most of the survey focuses on programmatic issues such as quality of housing, group meals, the clients, and the instructors and other personnel. The only question on the program evaluation survey that relates directly to the course learning objectives is high-level – students rate the following statement on a Likert agreement scale: "This program was valuable in helping broaden my global perspective of the world." In addition, the program evaluation survey is entirely based on student perceptions of their learning.   For these reasons, we do not rely on the program evaluation survey for *learning objectives* and *Global Competency Outcomes* measurement.

Sample assessments for one GCO and one disciplinary-content learning objective are shown here. The GCO evaluation shown here focuses on how the students interact with Argentines.

GCO #3: Demonstrate an ability to integrate knowledge of Argentine culture into their interactions with people and creation of client deliverables.

Activities Related to this GCO	Methods/Sources of Evaluation
• Pre-departure meetings, readings	• Reflection in journal
• City orientation,	• Observation at client site
• Ex-Pat Speaker	• Final Essay
• Client interactions	• Oral client briefing
• Free days, excursions	• Technical report
• Work off client site	

Evaluation

With this being a study abroad course it is clearly an objective to have the students try to integrate themselves into the culture while doing their work. The understanding that just doing the work as they would if they were tackling their regular assignments back in the United States would not be enough. They would have to step into the world of the client and understand how the culture and environment affect the way the business is run so as to have a truly integrated solution to their project. For instance, deadlines are not as meaningful the Argentine culture as they are in the United States. As such, we witnessed several students learning to how to follow-up with their clients effectively to ensure that the clients delivered on their promises (e.g., sending data, answering a question, etc.).   Here are a few of best excerpts from the students journals:

"Argentine culture is much more affectionate than that of the United States. People stand closer to one another, public displays of affection are socially accepted, and a kiss on the cheek is used to greet and say goodbye to people. To try to better immerse myself, while in

Mendoza I made an effort to greet people in such a manner, particularly at the client site with [our clients]."

"Our presentation was not only good because of the content or the flow, but also the way in which we presented the information. [student name] was able to translate some confusing parts into Spanish to better explain exactly what we meant, and both of us were able to smoothly interject a key point"

The disciplinary learning objective assessment from the Argentina program focuses on students' ability to generate and evaluate solutions to their client's problem.

Disciplinary Content Objective #10: Generate and evaluate alternative solutions to a problem.

Activities Related to this Objective	Methods/Sources of Evaluation
• Client interactions • Work off client site	• Final Essay • Observations • Oral client briefing • Technical report

Evaluation

The projects all demonstrated the use of creative alternatives and solid evaluations for the clients. Each set of teams were given the opportunity to try and discover the alternatives and then evaluate them. More specifically:

Team A
The team did a great job at look at each set of alternative programs (even creating a program of their own in Excel). They tested of the programs and were able to develop a great recommendation where they could combined several alternatives to accomplish all the objectives of [the client's] shipping requirements.

Team B
This team generated several alternatives that were realistically implementable and iteratively evaluated them. This lead to several evaluations of the alternatives to see which would best accomplish the objectives.

Team C
The team generated a number of alternatives through doing a series of brainstorming sessions and research on how other warehouses kept track of their supplies. They were able to narrow down their alternatives to three realistic products and did a nice job of presenting the evaluations of the products to the client.

Team D
   "We generated three alternatives based on the concept of only storing the top six sold varietals in [our client's] new on-site warehouse. From there, we had two alternatives that we ran on a simulation we created using Excel and a distance measurement generator that could tell us the distance that had to be traveled by a forklift from each holding rack position to the shipping area of the warehouse. Using the simulation, we were able to match up wines by seasonality in one alternative and by type (white versus red) in another alternative see how they would effectively fit into the holding racks and flow within each sector at different points in the year, in order to be stored the most efficiently."

The primary point of showing these assessments is to highlight how the close relationship between students and instructors gave the instructors a deeper ability to assess student progress directly from observations. For GCO #3, the faculty directly witnessed students taking actions to work more effectively with their clients: e.g., setting daily meeting times with clients, sending follow-up emails to clients, not getting upset when clients did not follow-through. For Disciplinary Content Objective #10, a frequently "hidden" part of the technical approach, generating and evaluating alternatives, was made visible to the instructors because the instructor was working with each team every day for an hour each day. Students did not go off and do the work between classes as they might on campus – doing the work _was_ class. The instructors were involved with the teams continually.

A secondary point is to show how multiple data sources were used to inform the assessment. Observations, client deliverables, and final essays all informed the evaluation of the Disciplinary Content Objective #10. Even more sources were used to inform GCO #3.

Panama Program Assessment

A sample assessment for a GCO for the Panama program is as follows.

GCO #3: Students demonstrate understanding of themselves and their ability to cope and adapt (attitude about self).

Activities Related to this GCO	**Methods/Sources of Evaluation**
• Pre-departure meetings, readings	• Reflection in journal
• City site visits/lectures	• Observation of student behavior
• meetings with Panamanian faculty	• Final integrative Essay
• meetings with Panamanian students	
• Free days, excursions	
• writing the final integrative essay	

Evaluation

Students are thrust into situations in which they must interact with Panamanians, navigate the city, and engage in basic commerce at grocery stores, restaurants, etc. Student journal reflections open a window to the student's adaptation and ability to cope in such situations. But the Final Integrative Essay reveals the most about this dimension of student development. The FIE is submitted about 10 days after the return from Panama, and it allows students to have more time to reflect and decompress from their intense experience in country. The grading rubric, given to students at the time the essay is assigned and shown in Appendix B, emphasizes the self-reflective nature of the experience, and sets student expectations about the assignment. Here are a few of the best excerpts from the final reflective essays:

"It's easy to read the study abroad learning objectives as distinct concepts: gaining knowledge of our American culture in the context of other cultures, demonstrating and appreciating sensitivity to other cultures, being self-confident of our own decision-making abilities, interacting skillfully in situations where English is not spoken, and actively seeking out diverse cultural situations. But looking back, almost every single situation I encountered in Panama that was not on a scheduled group outing required honing of every single one of the objectives. They aren't separate – each one necessitates all the others".

"The first few days, as I'm sure many of my classmates could attest to, I had some difficulty dealing with the locals. It has been said I lack patience, but the attitude is more a love of efficiency than anything else. Unfortunately, as I soon found out, Panamanians exhibit less inclination to be efficient than basically any other culture I have come into contact with, even the French. The first couple meals, I couldn't contain my anger towards our waiters, who seemed to have difficulties getting the correct meal, splitting the bills, and generally being attentive to the table. I almost reached a breaking point with our experience in Casco Viejo (the first time), where a simple lunch took 2 ½ hours to complete. After getting back to the hotel that afternoon, bemoaning the time wasted which ruined my chance to see the Gauguin exhibit, I realized I had to make a decision. I could either accept the Panamanians for who they were, and adjust accordingly, or I could become a miserable bitter traveler for the rest of the trip. There was only the one option, which after I resigned myself to, ended up coming quite in handy just a couple days later."

In general, these essays were a great joy to read, and they supported everything the instructors witnessed in terms of student personal and professional development during our time in country. Watching the transformation of the student who wrote the second excerpt above was both gratifying and impressive. This student eventually realized that the GCOs are equal parts window and mirror. Travel and study abroad allow us to learn about "others", but they also empower us to learn about "self".

The course learning objective 2(a) was assessed via an assignment called the "letter home", in addition to in-class discussion and instructor observations. Each student was assigned a persona of a worker in Panama, and the assignment was to write a letter home to family and friends expressing their experience in Panama. Example persona include: a Barbadian canal construction worker in 1907, a Panamanian food vendor working in the Canal Zone in 1926, or a merchant sailor passing through the Panama Canal in 1920. In each case, students were expected to adopt the persona, to think critically about the conditions in Panama at the time, and to describe their experience.

Course Objective #2(a): Describe the historical context of the on-going differences in treatment of workers from different racial and ethnic backgrounds during the period 1904-1999.

Activities Related to this GCO	Methods/Sources of Evaluation
• Pre-departure meetings, readings	• In class discussions
• City site visits/lectures	• Observation of student behavior
• meetings with Panamanian faculty	• Essay: "letter home"
• meetings with Panamanian students	
• Free days, excursions	
• writing the "letter home"	

Evaluation

Students in general embraced the letter home assignment and did an excellent job of capturing the persona of their character and that character's experience. The average student score on the letter home was about 18/20 according to the grading rubric in Appendix C. Students demonstrated great insight and clearly were very thoughtful about their character's plight, especially considering their race/ethnicity, the dominant culture in Panama at the time, and the prevailing circumstances and generally growing tensions between white Americans and everyone else in Panama at this

time due to both American behaviors and American policies emerging for operation of the Canal and governance of the Canal Zone.

Class discussions were lively and fruitful as well, and having these discussions in the remnants of one of the greatest symbols of American imperialist power in the country (the former Fort Clayton, the current City of Knowledge) really made an impact on the students and stimulated a wide-ranging discussion about the history, intent, circumstances, and social justice elements surrounding race relations and American presence on the isthmus. During each class discussion, the instructor and TA shared moderation duties and took reasonably careful notes about which students contributed to the discussion, who made interesting or insightful points, and who essentially re-stated fact. By reviewing these notes after class, the instructor and TA were able to rate the quality of each student's interactions during class discussions.

Based upon these two sample assessments, and as with the Argentina program, the close connections between students and instructors encourages the strong use of observation (of in-class discussion) as well as more conventional measures (the final reflective essay and the letter home) to evaluate student achievements. The class discussion notes and post-discussion review was very helpful in solidifying evaluations of students for their participation in class.

Discussion and Conclusions

This paper is intended to provide a lens on several issues related to short-term engineering study abroad through examining two such courses in Latin America. The authors realize that the emergent themes resulting from analyzing these two case studies may not be generalizable to all such programs. The objective, however, is not generalizability. Instead, the objective is to provide a rich description of themes that could later be studied across a broader set of programs while also being useful for individuals creating programs similar to these. The findings are as follows.

Evaluation Needs to Reflect Context of Course. The low student:faculty ratio and intensity of the shared experience between instructors and students increase the utility of direct observation as an evaluation method. Additionally, due to the complex and disparate nature of the learning objectives of each course, *multiple data sources are used to inform student evaluation*. A single artifact, e.g., a final essay, is not likely to contain enough relevant information about how well each student achieved learning objective, especially the GCOs.

Feedback for Students is Quick on Short-term Study Abroad Programs. Because instructors and students are spending nearly all of their time together without "distractions" from other courses, activities, people, etc., instructors can give feedback to students very quickly, problems can be identified and remedied quickly, and the social bond among the students tends to reinforce a shared understanding of class and behavioral expectations.

Institution-wide Global Competency Outcomes are Met in Different Ways by Different Programs. Study abroad programs have considerable flexibility in how they meet GCOs defined at a university level. Well-constructed GCOs can be adapted to fit different programs in different ways. In the case of these two programs, several of the same GCOs are targeted using *different class experiences, several different evaluation methods, and with different degrees of depth*. In addition, while the two programs targeted different GCOs in different ways, both

programs explicitly linked the GCOs to course learning objectives whenever possible. Despite strong connections to the GCOs (which are note explicitly targeted to engineering courses), these two engineering courses still retain an engineering identity within the context of satisfying the GCOs.

Gaining Knowledge About versus Gaining Experience Doing: Two Different Models. The Argentina and Panama programs are particularly interesting to compare due to their differences. The core difference is in the learning objectives: the Argentina program is more about learning how to do engineering and business in Argentina, while the Panama program is more about gaining knowledge about cultural forces shaping the canal, Panama's history, and Panama-US relations. Short-term engineering study abroad is not one-size-fits-all, and of course there is considerable elasticity in how such programs are defined and executed. We have shown here that there are multiple ways to map the GCOs to course learning objectives, multiple pathways to evaluating students for their achievement of both course objectives and GCOs, and multiple measures used to construct those evaluations.

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Appendix A: Global Competency Outcomes for this university

Global Competency Outcome #1: Students apply their knowledge to create a global frame of reference in their response to situations and events (knowledge).

a. students demonstrate knowledge of interconnectedness/interdependence of political, environmental, social, and economic systems on a global scale and in a historical context
b. students understand their own culture within a global/comparative context
c. students apply culture-specific knowledge to think critically and comparatively about global issues

Global Competency Outcome #2: Students understand, respect, and appreciate cultural differences (attitude about culture).

a. students are able to observe while reserving judgment and to interpret unfamiliar cultural contexts
b. students are aware of and sensitive to other cultures' norms and customs
c. students understand what is distinctive about their own culture in comparison with other cultures
d. students understand and value differences between US culture and other cultures and traditions
e. students appreciate the role of customs and tradition in determining acceptable behavior, attitudes, and perceptions

Global Competency Outcome #3: Students demonstrate understanding of themselves and their ability to cope and adapt (attitude about self).

a. students are open to discovery (curiosity)
b. students are able to adapt to changing circumstances (flexibility)
c. students are able to retain composure and equanimity when they do not have information to cope with uncertainty (tolerance and ambiguity)
d. students are able to cope with frustration, adversity, or challenging circumstances (resilience)
e. students are able to develop new strategies/styles for learning (originality, creativity)
f. students demonstrate self-confidence and decision-making capabilities (independence)
g. students demonstrate understanding of themselves and their ability to cope and adapt (self-knowledge)

Global Competency Outcome #4: Students apply their knowledge of intercultural communication to adapt to a different culture and to interact effectively with those from a different culture or cultural background (skill).

a. students demonstrate proficiency in host language sufficient to interact and engage with host community
b. students demonstrate appropriate use of non-verbal communication
c. students demonstrate appropriate use of etiquette (greeting, thanking, gifting)
d. students are able to cope in situations and activities where English is not spoken
e. students are able to match behavior/communication to cultural environment
f. students are able to interact effectively with people from another culture

Global Competency Outcome #5: Students seek out opportunities for engagement (action).

a. students seek out knowledge and different perspectives on global events and issues
b. students seek out and engage in diverse cultural situations
c. students will continue to seek out opportunities for engagement

Appendix B: Final Integrative Essay Assignment and Grading Rubric (Panama)

Assignment: Final Integrative Essay

Assignment Description

The final integrated essay is a <u>10-page max (single space) document</u> focused on demonstrating what the student has learned (and how) with respect to the learning outcomes of the course. A template for this essay is described later in this document. In the essay, study abroad learning outcomes and course-specific learning outcomes must be directly addressed in an integrated way that describes your *experience* in Panama--academic, cultural, social, etc.--and the impact that experience has had on you as a person. Students should use specific examples from the trip to Panama to demonstrate learning of each learning objective they address. **This essay is due on Tuesday Jan. 22,** so students will have time to contemplate this question and reflect on the total experience before writing their integrated essay.

Assignment Template

Each essay MUST have the following four sections:

- <u>study abroad learning outcomes (~2 pages)</u>: describe in detail how your experience in Panama supported your achievement of several of the study abroad learning outcomes described below
- <u>course-specific learning outcomes (~2 pages)</u>: describe in detail how your experience in Panama supported your achievement of several of the course-specific learning outcomes described below
- <u>reflection and integration (~4 pages)</u>: describe in detail, using personal observations and insights, how your experience in Panama has caused you to think (differently?) about the canal as a sociotechnical system; about yourself as a person, a learner, and a traveler; and about your identity as a resident/citizen of the United States
- <u>summary (< 1 page)</u>: a final summary paragraph about your experience in Panama

You can add images from your personal collection (i.e., pictures that <u>you have taken</u>, no outside images please) if you want to, but be careful about taking up too much space with images. You can cite references as appropriate, and use good attribution practices.

What the integrative essay is <u>not</u>:

- this essay is <u>not</u> about statements of fact regarding the canal, its history, the history of Panama, etc.--do not view this as a research/factual report about Panama
- this essay is <u>not</u> a persuasive piece--you are not trying to convince me to adopt your position
- this essay is <u>not</u> an opinion piece about Panama or the course--you should not focus on your feelings about Panama, or about the course per se; focus on how the experience impacted <u>you</u>

This <u>is</u> a <u>reflective</u> piece, in which you take your personal experience, merge it with facts you learned throughout the course, and describe in a very personal way how the experience impacted

you. Cite facts necessary to support your reflection. Clearly connect it to the learning outcomes. But remember that there is no right answer to this, and every one of us had a slightly different experience during the course. Be honest, thoughtful, and construct good arguments--grounded in both facts and the learning outcomes--about how you have been impacted by the experience.

Final Integrative Essay Grading Rubric

Name:

Rubric (highest possible score: 20)

	Score
Study Abroad Learning Objectives: 5 = SA learning Objectives are addressed clearly and describe several excellent learning experiences gained from your visit to Panama and readings 3 = SA learning Objectives are addressed with only a few supporting examples 1 = SA learning Objectives are not addressed in any detail, with little or no supporting examples	
Course-Specific Learning Objectives: 5 = At least five of the course-specific learning objectives are addressed clearly and several excellent learning experiences from your visit to Panama are described 3 = At least three of the course-specific learning objectives are addressed and a few learning experiences from your visit to Panama are described 1 = Course-specific learning objectives are not addressed in any detail, with little or no supporting examples	
Reflection: 5 = excellent and insightful reflection about the (study abroad and course-specific) learning objectives which integrates personal observations and insights 3 = adequate reflection which illustrates some personal impact from your learning experiences 1 = poor reflection which does not convey any critical thought, internalization, or reflection about the learning objectives	
Mechanics: 5 = well written, concise, well sourced, easy to read, well proofread 3 = sufficiently clear, sourced, readable, adequately proofread 1 = poorly written, with poor attention to detail and proofreading	

Total Score:

Comments:

Appendix C: Grading Rubric for the "Letter Home" (Panama)

Persuasive Essay 2 "Letter Home": Grading Rubric

Name:

Premise:

Rubric (highest possible score: 20)

	Score
Creativity: 5 = excellent recounting of life in Panama through the eyes of your character, with insightful consideration of what elements impacted their quality of life, their political positions, daily activities, and more 3 = adequate recounting of life in Panama with some consideration of quality of life, politics, economics, world events, etc. 1 = very little story surrounding the character	
Critical analysis: 5 = excellent insight displayed in synthesizing what you have learned through readings, and museum visits, etc into the characters 3 = adequate insight displayed with moderate synthesis of available information 1 = poor critical analysis which essentially restates facts instead of demonstrating insight	
Reflection: 5 = excellent and insightful reflection about the conditions of life of your character that integrates your personal observations/experiences 3 = adequate reflection which illustrates some personal impact of the Panama life 1 = poor reflection which does not convey any critical thought, internalization, or reflection about the conditions of life in Panama at the time of your character	
Mechanics: 5 = well written, concise, factual, easy to read, well proofread 3 = sufficiently clear, factual, readable, adequately proofread 1 = poorly written, with poor attention to detail and proofreading	

Total Score:

Comments: