An Interprofessional, Intercultural, Immersive Short-Term Study Abroad Program: Public Health and Service Systems in Rome

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Abstract:

The purpose of this paper is to describe a short-term study abroad program that exposes engineering and nursing undergraduate students from the United States and Italy to an intercultural and interprofessional immersion experience. Faculty from Purdue University and Sapienza Università di Roma collaborated to design a technical program that demonstrates the complementary nature of engineering and public health in the service sector, with Rome as an integral component of the program. Specifically, the intersection of topics including systems, reliability, process flow, maintenance management, and public health are covered through online lectures, in-class activities and case study discussions, field experiences, and assessments. Herein, administrative issues such as student recruitment, selection, and preparation are elucidated. Additionally, the pedagogical approach used to ensure constructive alignment among the program goals, the intended learning outcomes, and the teaching and learning activities is described. Finally, examples of learning outcomes resulting from this alignment are provided.

Introduction

Participation in study abroad programs for students attending United States institutions has increased significantly over the past several years. According to the Institute of International Education (IIE), the number of Science, Technology, Engineering, and Math students participating in study abroad programs has increased 123% from 2006-2016 (IIE, 2007, 2017). Simultaneously, a 10% increase in the number of students participating in short-term programs over the same period has occurred, while mid- and long-term program participation has decreased (IIE, 2007, 2017). Daniel, Xie, and Kedia (2014), in their survey of over 800 industry executives in the United States, indicate that these experiences may be critical for future business within the increasingly global economy. The higher education system, therefore, must adapt and provide students with

international opportunities that meet their developmental needs and fit within their plans of study and budgets. The purpose of this paper is to (1) describe the administration of a short-term study abroad program for engineering and nursing students, (2) articulate the constructive alignment between the program goals, intended learning outcomes, and teaching and learning activities, and (3) provide evidence highlighting how this alignment contributes to effective student learning outcomes.

Studies have shown that participation in study abroad programs can foster international awareness and improve student attitudes towards foreign cultures (Carlson & Widaman, 1988); enhance cross-cultural skills (Kitsantas & Meyers, 2002; Kitsantas, 2004); and increase reflective thought, self-confidence, and interest in and understanding of the well-being of others (Kuh & Kauffman, 1984). Such positive outcomes help build the cultural competence students need to succeed in the global workplace (Lewis, 2005; Molinsky, Davenport, Iyer, & Davidson, 2018).

Study abroad experiences can range from multi-semester degree programs to short-term immersion experiences. Traditionally, the majority of study abroad experiences have been semester or full academic year programs that "require substantial initiative on the part of the student" (Parkinson, 2007, p. 2), including identifying course equivalents, deciding to extend their programs of study to include the study abroad experience when course equivalents cannot be identified, and managing the logistics of traveling and living in their country of choice.

Students in professional programs such as engineering and nursing, however, may encounter significant barriers when attempting to fit a semester- or year-long study abroad program into their plans of study. Three such barriers are the radically different curricular requirements across programs, language barriers that may prohibit their success in their country of choice, and the cost to participate in longer-term programs in terms of both the additional expenses associated with study abroad experiences and the time required to complete their undergraduate degrees. Therefore, the number of short-term study abroad programs has been increasing (Dwyer, 2004; IIE, 2007, 2017) to meet the diversity of demand for study abroad opportunities that are flexible enough to fit within academic programs and student budgets. Recent research suggests that short-term programs can have a positive impact on overall intercultural sensitivity by reducing students' propensities to view some cultures as superior and increasing their acceptance of and adaptation to cultural differences (Anderson, Lawton, Rexeisen, & Hubbard, 2006). Moreover, short-term programs can enhance students' cultural self-awareness and view of global political issues (Lumkes Jr., Hallett, & Vallade, 2012).

Program Overview and Administration

Program Overview

The mission of this program is to provide upper-level undergraduate students (i.e., industrial engineering and nursing students (Purdue University) and mechanical and aerospace engineering students (Sapienza Università di Roma)) technical exposure to the complementary nature of engineering and public health in the service sector, including a short-term study abroad experience for the Purdue students and an intercultural experience for all program participants. The program is designed as a three credit hour experience delivered over approximately three months, culminating in a one-week immersion in Rome, Italy during the Purdue students' Spring Break (a one-week holiday in mid-March). This schedule addresses barriers associated with engineering and nursing students'

curricular requirements that make longer study abroad experiences difficult and does not conflict with traditional semester obligations (e.g., nursing clinical training, examinations), while maintaining the benefit of exposing students to the richness of intercultural experiences.

Program content was designed collaboratively by the program faculty from both Purdue and Sapienza. It builds upon the students' technical foundations gained through their more traditional coursework, highlights the utility of interdisciplinary and intercultural collaboration, and is delivered via three modalities (online, in-class, and in the field). Additionally, the course includes numerous in-country activities such as in-class lectures, team active learning exercises, tours of historical sites (e.g., Coliseum) and industrial organizations (e.g., Policlinico Umberto I), and scholarly assignments. Students engage in approximately 58 total instructional contact hours. Graded coursework includes individual and team assignments. Extensive detail describing the academic components is provided after an overview of the program's administration.

Notably, all programming is conducted in English. From a study abroad perspective, this approach may limit some of the intercultural experiences accessible to the Purdue students, but is pragmatic given the technical focus of the program coupled with the short time in country. Moreover, it fulfills one objective the Sapienza professor has for his students, which is to garner more experience practicing their English-language skills in a professional environment. For the Purdue students, they have the opportunity to begin broadening their worldview, which may not have been feasible if Italian language skills were a prerequisite, "by cultivating empathy with the views of others; standing in their shoes in their geographical, historical, and philosophical location; [and] seeing [themselves] from that perspective" (Lewis, 2005, p. 128).

Program Administration

Program administration, described in this section, was developed to align with the *Standards of Good Practice for Education Abroad* published by The Forum on Education Abroad (2015).

University policies, resources, and program vetting

The Purdue International Programs Office oversees all academic activities with an international component (e.g., international students studying at Purdue, study abroad programming). The Study Abroad Office, within the International Programs Office, establishes a range of policies governing all study abroad activities. For short-term programs specifically, policies include establishing a 10:1 student-to-faculty ratio, articulating the steps required to successfully develop and receive approval for programs, and communicating the code of conduct for students studying abroad and the corresponding resources available to faculty if they face behavioral issues while abroad.

Purdue has committed significant resources to study abroad programming at both the university and college levels. At the university level, the International Programs Office funds grants for the creation and improvement of study abroad programs, provides certifications for students, and conducts many other activities. Additionally, their Center for Intercultural Learning, Mentorship, Assessment, and Research (CILMAR) provides mentorship, workshops (i.e., Acirema simulation), and the requisite training and support required for faculty and staff to become Qualified Administrators of the Intercultural Development Inventory (IDI). For short-term study abroad programs, such as the one described herein, the Study Abroad Office provides assistance with a variety of activities including planning and marketing programs, enrolling and vetting students, and

delivering pre-departure information sessions for faculty and students. These information sessions are tailored for their specific audiences and cover issues such as the university support and services available while abroad and the university's expectations of and responsibilities for students while abroad. At the college levels, staff and financial resources are available to support program development, marketing, and logistical planning.

All prospective study abroad leaders must meet Purdue University's rigorous standards for establishing study abroad programs. Leaders submit proposals that summarize program designs, including plans for increasing intercultural competence among participants (using research supported assessments), itineraries, preliminary budgets, risk assessments and mitigation plans, and verification of departmental approvals of credit hours to be granted for successful completion of the programs. Proposals then must be vetted by the faculty members' department heads and deans, and by the university-level Office of Study Abroad before the Dean of International Programs grants final approvals.

Program leader collaboration

This program emerged from a long-term collaboration between the program leader from Sapienza and one of the program leaders from Purdue. The two additional Purdue program leaders were invited to join the teaching team to augment the content expertise and meet the requisite 10:1 student-to-faculty ratio mandated by Purdue. Collectively, this set of program leaders has the expertise in engineering and public health necessary to develop and deliver the technical content in this program, which is described in a later section. To that end, the program leaders worked collaboratively to determine the program goals and identify content requirements, including the assessment completed by students from both universities, to meet those goals. The leader with the relevant expertise then developed the specific instructional materials. Additionally, all leaders debrief every time the program is delivered to determine what improvements will be made for the next iteration (e.g., shifting some of the lecture content from the classroom to online to provide more time for students to engage in both formal and informal intercultural exchange). Finally, student recruitment, oversight, and grading are done independently (i.e., Purdue leaders are responsible for Purdue students and the Sapienza leader for the Sapienza students).

Student recruitment and selection

Student recruitment is handled similarly for both Purdue and Sapienza students. Class announcements, flyers, internet postings on the faculty and study abroad websites, and information sessions were used to inform students of the opportunity. Only upper-class students (e.g., junior and senior students from Purdue) were eligible to participate because the program was designed to build upon their technical coursework. At Purdue, the student selection process started with the Study Abroad Office ensuring that the students' grade point averages met the minimum threshold for participating in study abroad. Next, the program leaders reviewed the applicants' performance in key discipline-specific courses to ensure they had the requisite technical foundation. At Sapienza, students were required to provide a written explanation describing why they were interested in participating in this program and a self-assessment of their English proficiency. Those students with the highest self-assessments were then interviewed in English to verify their language skills.

Student preparation pre-departure

Prior to the Purdue students arriving in Rome, all students participated in preparatory activities. At Purdue, three one-hour class periods were devoted to pre-departure activities. At the first class, the academic requirements and conduct expectations were described. The academic requirements are described in detail in subsequent sections of this paper. The behavioral requirements focused on professionalism, which included being punctual, following the dress code, and maintaining decorum at the hotel; infractions resulted in grading deductions commensurate with the severity of the incident. Additionally, students were introduced to intercultural business norms through readings (e.g., Lewis, 2005) and discussion.

The additional two class periods contained a mix of logistics and cultural preparation. Logistics preparation included describing passport/visa requirements, transportation logistics between the United States and Italy, emergency procedures while in country, including meeting points and emergency contacts, health and safety risks (e.g., be aware of your surroundings and watch your belongings so they are not stolen), including how to inform program leaders about specific individual concerns, setting expectations with family and friends about communication frequency, and suggestions for what to pack. Cultural preparation included describing norms for eating and drinking in Rome, reflecting on what can be learned about cultural and behavioral norms by observing locals, participating in language lessons focused on vocabulary useful in travel (e.g., basic phrases useful when greeting others, dining out, and shopping), and discussing assigned readings describing Roman history, culture, and the venues that would be toured.

The Sapienza students attended one preparatory meeting where students were provided with the academic requirements of the program, instructions about accessing the required online lectures and quizzes, and conduct expectations (e.g., business casual dress code and a request to not smoke while with the Purdue students given the different smoking norms in the two countries).

Curricular Foundation and Program Goals

Curricular Foundation

Three specific aspects comprise the foundation upon which the program was built: (1) the integration of engineering and nursing; (2) the development of an intercultural, immersive education experience; and (3) the selection of Rome as the location for this specific program.

The decision to integrate engineering and nursing into this program was threefold. First, engineers tend to focus on systems without necessarily considering the manner in which humans interact with the system, while nurses spend much of their time focusing on the individual and little time thinking about the systems in which they are embedded. Structured interactions can help students broaden their socio-technical perspectives, thereby providing greater balance to both disciplines (Malcolm, 2008). Second, nurses represent the largest profession in the healthcare system (Health Resources and Service Administration, 2012), are involved in the day-to-day issues that plague it, and can provide needed domain expertise to engineers who possess the technical expertise required to address many of the healthcare delivery issues they face (Reid, Compton, Grossman, & Fanjiang, 2005). Thus, students from both disciplines can practice interacting with colleagues who possess complementary domain expertise in meaningful ways. Third, Purdue-educated nurses are particularly suited to collaborating with engineering students as systems and quality improvement

approaches are embedded in their curriculum, and as they are experienced with a variety of acute and community-based healthcare settings (Karagory & McComb 2014; McComb & Kirkpatrick, 2017; Simpson, McComb, & Kirkpatrick, 2017).

The program is intercultural in that faculty and students from Purdue and Sapienza participate in the academic activities. Simultaneously, the intensity of the learning experience over the short time in Rome is enhanced through immersive classroom and field activities requiring students from different cultural and professional backgrounds to interact as they examine how services are delivered, maintained, and managed within the context of Rome. This immersive, intercultural exposure, in conjunction with interprofessional collaboration, broadens the students' perspectives in three distinct ways as they engage in all aspects of the program. First, the students' professional perspectives are expanded through the interactions and through students' development of critical insights into and reflections about the content domains of engineering and public health as they apply to the service sector. Second, as students overcome preconceptions, they improve their cultural competency. For example, Purdue and Sapienza students arrive at the first classroom session with preconceived notions about each other's behaviors and characteristics that are influenced by social media, television, movies, etc. As the students share stories about their families, friends, and social activities over the week, more realistic perceptions and views of their respective cultures emerge. Third, the students' comfort with communicating effectively increases despite language barriers. This process is aided by the translation assistance of Sapienza students more fluent in English and the perseverance of all students in rephrasing their thoughts as more formally constructed ideas (i.e., no colloquialisms). By the end of the program, students are able to communicate efficiently as they complete program activities and the team project.

The location of this program was also purposeful. The city of Rome is an integral component of the learning experience. Where better to study engineering and public health than in the city where the first significant, systematic advances were made in these fields? For instance, the first engineering handbook, *De Architectura*, was written by the Roman Marco Vitruvius Pollio during the reign of Caesar Augustus. While this treatise catalogs the variety of building methods employed by the ancient Romans, the physical evidence still observable in Rome underscores their significant strides in engineering that were built upon the engineering feats of the Egyptians, Greeks, and others (de Camp, 1993), including developing civil infrastructure such as aqueducts, sewers, and roads, constructing stone assets such as the Coliseum, and transporting obelisks from Egypt to Rome via specially designed ships. Engineering was certainly applied as the Romans established the first public health system. They believed that cleanliness would lead to good health. Moreover, they linked causes of disease and methods of prevention. As a consequence, they developed public health works around their empire. Thus, Rome exposes students to an environment that blends historic and modern worlds seamlessly, addresses engineering and public health issues across the service sector (e.g., transportation, tourism, healthcare), and provides a glimpse of multiple historic time periods.

Program Goals

To begin developing this interprofessional, intercultural, immersive education experience, the faculty established the following four program goals:

1. Introduce a systematic view of how engineering and public health are applied in the service sector, including the relevance of each discipline's respective domain expertise in the service sector, the utility of understanding similarities and differences in how the two countries approach managing and maintaining services, and the varying ways in which these topics are operationalized in the field;
2. Provide an opportunity for students to engage in, and appreciate, intercultural and interprofessional collaboration;
3. Encourage students to compare and contrast Italy and the United States with respect to educational systems, healthcare, cultures, and lifestyles;
4. Expose students to the historic and cultural beauty of Rome.

Intended Learning Outcomes

Constructive alignment (CA) suggests that all components of the learning environment are connected (Biggs & Tang, 2011). Specifically, CA follows the process of formulating *intended learning outcomes (ILOs)*, then selecting *teaching/learning activities* to support the ILOs, and developing *assessment tasks* on which to judge students' work such that grades can be assigned.

ILOs are constructed with a verb corresponding to an appropriate level of understanding, content, and context (Biggs & Tang, 2011). The levels of understanding can come from any number of taxonomies, such as Bloom's revised taxonomy (Anderson & Krathwohl, 2001), Fink's taxonomy for significant learning (Fink, 2013), or the SOLO taxonomy (Biggs and Collis, 1982). The instructional team chose to use Fink's taxonomy for significant learning to translate program goals into intended learning outcomes to describe what students should achieve by successfully completing the program.

The intended learning outcomes are detailed in Figure 1. Verbs that were emphasized in the construction of intended learning outcomes are identify, describe, map, and articulate, which span foundational knowledge through integration. This outcome map also depicts how the intended learning outcomes link to the program goals and how the teaching and learning activities, which will be described in the next section, are employed to help students achieve the intended learning outcomes across all six taxa.

Figure 1. Outcome Map Demonstrating Alignment Among Program Goals, Intended Learning Outcomes, and Teaching And Learning Activities

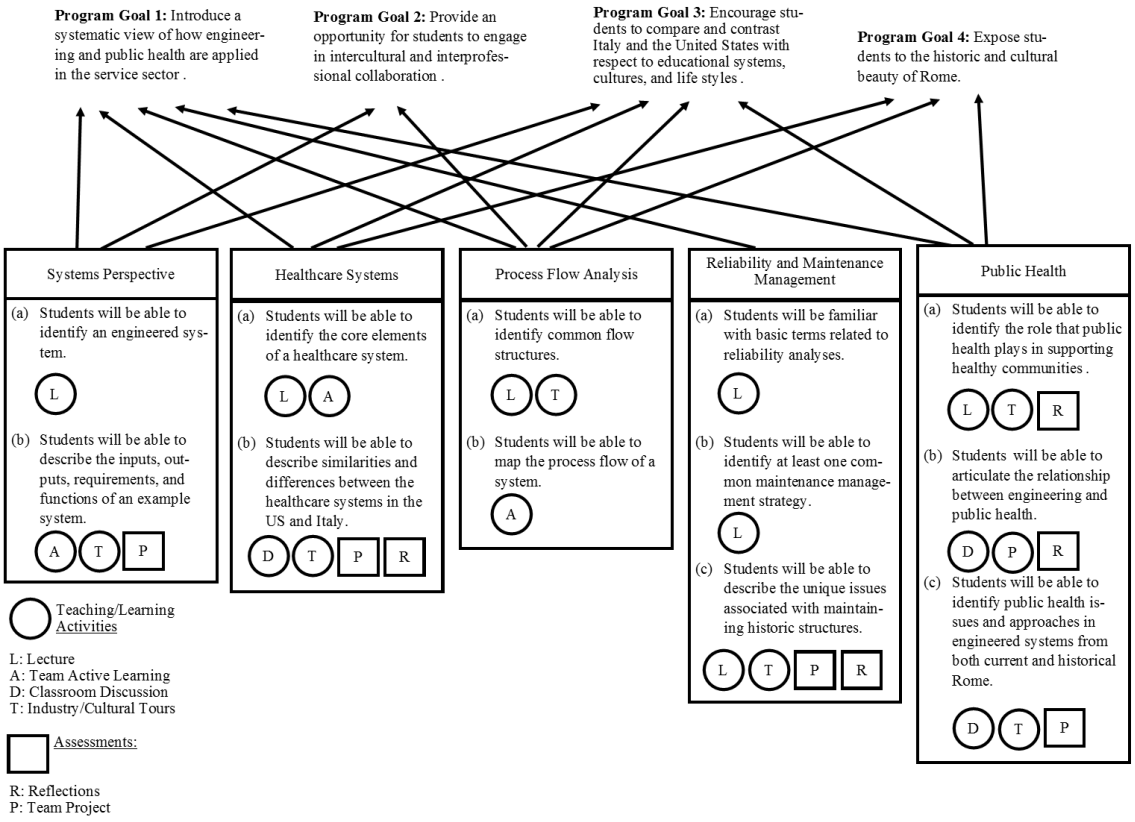

Table 1. The Relationship between Teaching and Learning Activities and Fink's (2013) Taxa

		Fink's Taxa					
		Foundational Knowledge	Application	Integration	Human Dimension	Caring	Learning How to Learn
Program Content	Lectures and Active Learning						
	Systems Perspective and Healthcare Systems	✔	✔	✔		✔	
	Public Health	✔	✔	✔	✔	✔	
	Process Flow Analysis	✔	✔			✔	
	Reliability and Maintenance Management	✔	✔				✔
	Tours	✔	✔	✔	✔	✔	✔
Assessment	Reflections (Purdue only)		✔	✔	✔	✔	
	Team Project (Purdue and Sapienza)	✔	✔	✔	✔	✔	✔
	Written Report (Purdue only)	✔	✔	✔	✔	✔	✔
	Oral Examination (Sapienza only)	✔	✔	✔			✔

Teaching and Learning Activities

Crafting teaching and learning activities that align with the intended learning outcomes represents the next step in curricular development (Biggs & Tang, 2011). The program content and assessments that comprise the program teaching and learning activities are also mapped to Fink's taxa in Table 1 and described in the following sections.

Program Content

Constructing appropriate program content that provides opportunities to span Fink's (2013) taxa associated with significant learning consistent with CA requires consideration at both the conceptual and the detail level. Fallahi (2008) developed four goals that are particularly useful in facilitating the conceptual level of this process. Her first two goals recommend decreasing the emphasis on program content and foundational knowledge, while increasing the emphasis on active learning, respectively. In designing the study abroad program, these two goals were addressed at the conceptual level in multiple ways. First, a reduction in foundational knowledge is possible by offering the program only to upper level students who already have a solid foundation comprised of the core concepts associated with their disciplines. Second, some foundational material, considered necessary to ensure a consistent base of knowledge across all participants, can be shifted to online modules completed by the students independently. Third, classroom sessions, particularly those led by the Purdue faculty, were designed to balance foundational knowledge dissemination through lectures with team active learning activities and classroom discussions to demonstrate application and integration.

Fallahi's (2008) third goal recommends applying content to real life problems. The manner in which this goal is addressed was described in the Curricular Foundation section, where the decisions to establish an intercultural, immersive education program in Rome that integrates engineering and nursing students was highlighted. Finally, Fallahi's (2008) fourth goal suggests that incorporating academic lessons into life lessons may enhance learning. The teaching team incorporated a strong emphasis on the human dimension and caring, the two socio-emotional taxa in Fink's (2013) taxonomy, to help students maximize the opportunity to garner intercultural sensitivity and cultural self-awareness, which researchers have shown may be successfully obtained through short-term study abroad experiences (Anderson et al., 2006; Lumkes et al., 2012).

Lectures, team active learning, and classroom discussion

Content lectures are partially delivered through online videos, one for each content area described below, made available to all Purdue and Sapienza students. Each video is roughly 25 minutes in length, and has an associated quiz to assess students' conceptual understanding of the topic. Having students independently view online lecture content minimizes the need to use the limited in-class time available to cover background material for which each disciplinary group has differing levels of knowledge. The online content establishes a consistent level of conceptual and analytical knowledge prior to when the Purdue students arrive in Rome. By moving content lectures to the period prior to arrival in country, students are able to (1) focus their attention in Rome on the application of the theoretical concepts to the tour locations, allowing for a deeper understanding of the systems-level implications of the historical and present-day evolution of Rome and (2) spend more time interacting with their counterparts, which allows for deeper conversations related to the similarities and differences between U.S. and Italian cultures.

In addition to online learning opportunities, the U.S. students engage in 12 hours of in-class instruction prior to departing for Rome that supplements the online lectures, with the focus on problem solving and teamwork. During the one-week immersion in Rome, Purdue and Sapienza students participate in a mix of lectures, team active learning activities, and classroom discussions that underscore the primary principles being taught in the program. These principles, and how they are operationalized, are described in the following sections.

Systems perspective and healthcare

The academic content of this program was designed to encourage students to apply their technical coursework in a new way. A systems perspective is embedded throughout the program, with particular emphasis at the beginning and the end. Two distinct philosophies within the systems context are emphasized. First, a general systems thinking perspective is presented, similar to the perspective presented in Meadows (2008). Emphasis is placed on unintended consequences of system design and emergence. Additionally, students are introduced to the notion of systems engineering, which is defined as "an interdisciplinary process that ensures the customer's needs are satisfied throughout the system's entire life cycle" and is comprised of seven tasks (acronym SIMILAR): state the problem, investigate alternatives, model the system, integrate, launch the system, assess performance, and re-evaluate (Bahill & Dean, 2009).

Second, healthcare, specifically, is used to provide specific examples of how systems analysis and systems engineering can be applied. The Institute of Medicine (2001) suggested that the 21st-century healthcare system, including public health programs and services, needs to be safe, effective, timely, patient-centered, efficient, and equitable. These goals cannot be met without input from both engineers and healthcare professionals, which piques students' interests in learning more about how seemingly different professions can meaningfully inform the work in both areas.

This material is presented to students at both the beginning and the end of the one-week immersion. At the beginning, a brief lecture is given to present approaches for taking systems perspectives across two contexts. At the end of the program, faculty-led discussions and the completion of a team project facilitate student integration of all program content within a systems framework. To provide specific context related to healthcare systems and public health, a case study related to New Zealand's healthcare system (Maani & Cavana, 2000) is discussed. This type of case is, generally speaking, the students' first exposure to how system dynamics modeling can be applied to study the impact of policy decisions on system outcomes. A point of emphasis within the discussion of the case is the differentiation of "complicated systems" from "complex systems," specifically, presenting the perspective that a system is more than the sum of its parts (Ackoff, 1971). With this case as a starting point, the student teams brainstorm ways in which interactions within healthcare systems might be designed such that systems "design themselves" to meet intended outcomes.

Process flow analysis

All industries, including healthcare, rely on the successful completion of processes to generate revenue and sustain their businesses. Process analysis has become a critical element of healthcare systems redesign in the United States (Miller, 2005; Spear, 2005; Keller, 2014; Karr, 2011). Processes represent how elements flow through a system toward completion. Different aspects of process

flow analysis are highlighted in this program, including (1) process documentation methods (e.g., operations process charts, flow process charts, and spaghetti diagrams (Lehto & Landry, 2012; Allen, 2010)), (2) quantitative metrics for process flow analysis (e.g., travel charting and distance (Tompkins, White, Bozer, & Tanchoco, 2010), Little's Law (Little, 1961)), and (3) service system process (e.g., orientation (Fitzsimmons & Fitzsimmons, 2010) and space (e.g., servicescapes (Bitner, 1992))) design.

During the class lecture, examples are culled from the students' experiences in Rome. For example, after visiting a hospital in Rome, students have the opportunity to compare and contrast what they know about hospitals in the United States with what they have seen in Rome, which is strongly enhanced by the nursing students who share insights gained through their clinical educational experiences. These observations are reinforced through a discussion about the similarities and differences in the two countries' healthcare systems (Fahnestock, McComb, Deshmukh, & Fedele, 2013). In addition, students work in teams to map the process flow for a system of their choice such as the security and ticketing process at the Vatican Museums or the user experience in the Rome metro system.

Reliability and maintenance management

A prominent performance metric for nearly all human-constructed systems is their reliability. Technical systems (i.e., buildings, industrial plants, infrastructure) need programmed maintenance to ensure safe, reliable functioning. Several concepts within reliability are presented as they relate to systems analysis, with an emphasis on reliability block diagrams and developing intuition about system reliability related to its flow structure (i.e., serial and redundant systems). Additionally, concepts such as Failure Mode, Effects, and Criticality Analysis (FMECA) and Fault Tree Analysis are also discussed as they relate to the design and improvement of systems (Ebeling, 1997; Blanchard & Fabrycky, 2011; O'Conner & Kleyner, 2012).

Students are introduced to maintenance as a strategic discipline combining social, economic, environmental, and safety aspects (Cigolini, Deshmukh, Fedele, & McComb, 2008). Organizations recover the costs associated with maintenance by, for instance, extending a system's useful life. Society benefits from longer system life because replacements that are manufactured from finite natural resources can be avoided or delayed, and because of the ability to interact predictably with fully functioning systems. To realize such benefits, organizations must analytically design their maintenance services to predict faults, down times, component or system replacements, and the associated costs.

Maintaining historic structures provides a unique set of systems challenges and a distinct application context that is prevalent in Rome. In some cases, the historic structures are modernized to serve as office buildings or housing, and the corresponding maintenance activities become the responsibility of the owners. In other cases, the historic structures are monuments with cultural value that may be difficult to ascertain, which in turn makes establishing the right value for maintenance activities difficult. In the case of Rome, public spending for maintaining these structures is very low (Day, 2015). Yet, the potential value of the historic monuments in Rome is very high. A recent assessment including only the most famous archaeological sites in Italy (representing one/third of the total archaeological assets in Italy) estimated a valuation of nearly 400

billion euros in terms of brand value and tourist activities (PriceWaterhouseCoopers, 2009). This reality has given rise to new approaches for funding maintenance activities, such as the recent private sector support for restoration activities at the Coliseum (Browning & Castelfranco, 2014).

Lecture content is delivered via an online module that students complete prior to the one-week immersion in Rome. It covers the basic elements of reliability analysis (reliability block diagrams, series vs. parallel systems, etc.). The maintenance management material is presented via lecture in Rome, where maintenance is presented in the context of Rome's historic structures. In addition, these concepts are incorporated throughout the lectures about other topics in an effort to integrate the program content.

Public health

Incorporating program content about public health provides engineering students with a new lens through which to view the service sector and nursing students with an appreciation for how systems, reliability, process flow, and maintenance can be integrated and applied to their area of expertise. Most importantly for both disciplines, students gain an appreciation for the need to consider multiple perspectives when addressing public health issues (Earnest et al., 2006; Mabry, Olster, Morgan, & Abrams, 2008).

The lecture content is grounded in the view of public health as a field that requires interprofessional and systems science perspectives to be successful. For example, public health professionals and engineers can work together to design strategies to address emerging threats to the public's health. Within the specific context of Rome, we employ a case study of Mykonos (Romanos, 2002) that requires students to consider how ancient and modern structures can successfully coexist, and the corresponding impact each has on the other. Students rarely contemplate how the large influx of tourists may influence the living patterns of permanent residents (e.g., disease transmission); the manner in which infrastructure may impact ancient structures (e.g., subway vibration transmitted to the Coliseum); and why maintenance is a critical, expensive necessity rather than a nuisance that ruins vacation photographs (e.g., current movement to crowdfund maintenance projects through websites like www.italiancrowdfunding.org). By emphasizing these types of issues, students are exposed to the complementary nature of engineering and public health in a way that broadens their perspectives and their appreciation for interprofessional collaboration.

Additional perspectives

In addition to the academic content disseminated through these online and classroom-based activities, students are also exposed to cultural differences in faculty-student interactions. In the United States, many professors focus on blending theory and practice into their courses, whereas in Italy the primary focus is on the organization of theoretic arguments. These foci translate into distinct teaching styles and learning objectives. Students in this program experience both approaches. In classroom sessions taught by the Purdue faculty, student participation is sought through interactive exercises and class discussions to facilitate student application of concepts. Alternatively, the session taught by the Sapienza professor is conveyed via lecture with the objective of transferring content to the students. As not all professors in the United States incorporate student engagement, the Purdue students have been exposed to this more rigid, individualistic learner

approach. The Sapienza students, however, are unfamiliar with the flexible, team-oriented active learning approach employed by the Purdue faculty. As the week progresses, they become more comfortable with participating in the classroom activities. These differences prompt conversations among students about educational norms (e.g., testing, assignments, interactions with faculty), thereby enhancing the significant learning associated with the human dimension and caring.

Industry and cultural tours

Students are exposed to many time periods through the industry and cultural tours, including ancient (e.g., Coliseum, Forum, Pompeii), Middle Ages (e.g., San Clemente, Santi Quattro Coronati), Renaissance (e.g., St. Peter's Basilica, Vatican Museums), and modern (e.g., transportation company, hospital). Together, these experiences provide cultural exposure for the Purdue students, while at the same time providing all participants with contextual examples that align with the academic program content. While much of the program material is appropriate for both engineering and nursing students, some aspects may be of more interest to one or the other. For this reason, on two occasions different activities are planned for the two groups. On one half day, engineering students tour ATAC, Rome's public transportation provider, and nursing students have an interactive session with Sapienza nursing faculty and students. Purdue nursing students are also given the opportunity to have a clinical experience at Santo Spirito Hospital one morning with their Sapienza counterparts. Although these activities increase the planning prior to the start of the program and organization during the program, they demonstrate the importance of increasing discipline-specific fundamental knowledge to enhance interprofessional collaboration.

Regardless of tour venue, students are able to integrate what they learn in the classroom with what they observe during tours as they discuss, for example, the similarities and differences between modern transportation approaches in the United States and Italy. Even the cultural sites provide a basis for applying the program content being presented by demonstrating, for instance, how tourists flow through the Vatican Museums or the impact of maintenance on the Coliseum in terms of preservation, expansion, and tourist experience. Significant learning about the human dimension, caring, and learning how to learn also may occur during tours by expanding students' views of the world, demonstrating the lessons offered by history, and experiencing good (and not so good) tour guides and how they provide an educational service beyond what can be observed or read in books.

Assessments

Assessments were designed around Fink's (2013) taxa, as depicted in Table 1, and the unique curricular objectives of the two participating universities. Both universities focus on the combination of intercultural enrichment and academic content embedded in this program, but the emphasis is different. For Purdue faculty, the emphasis was on providing a culturally rich program that builds upon and expands their academic training, as the university is committed to providing as many students as possible with international experiences "to foster intercultural learning and meaningful interactions between peoples of unlike cultures" (International Programs Office, 2016). Alternatively, the Sapienza faculty member sought to harmonize the content delivered in the program described herein with the Sapienza engineering curriculum, which is strongly focused on developing theoretical competencies. In both cases, students were assessed individually and as teams to maximize learning depth and breadth. Each assessment approach is briefly described in the following sections.

Reflection (Purdue students only)

Purdue students were required to complete individual reflective assignments throughout the week that encouraged them to contemplate the similarities and differences across the venues they toured (i.e., integration), in the students with whom they were teamed (i.e., human dimension), and how the classroom materials helped enrich their understanding (i.e., application and caring). Moreover, students were encouraged to apply content and integrate differing perspectives and approaches to problems and issues encountered from a cultural perspective as well as from engineering, nursing, and public health disciplinary perspectives. For the final reflection, students were asked to complete a cultural learning activity where they identified their core cultural values, and reflect on how they were similar/different from the cultural values of present-day Romans (Mikk, Cohen, & Paige, 2004). This final reflection is used to facilitate a cultural debriefing during one final classroom session after the Purdue students return to the United States. Reentry support includes a de-brief with students about their experiences that aligns with their reflection assignments. Thank you to one of the reviewers for suggesting that future programs could also include reentry activities such as identifying avenues for further international opportunities and creating talking points to use with their fellow students and prospective employers.

Team project (Purdue and Sapienza students)

Students were assigned to teams during the first classroom session of the program. By initiating team activities on the first day, students were immediately exposed to the benefits and difficulties associated with interprofessional and intercultural collaboration. The teams were constructed in real time by one of the instructors, who endeavored to ensure equal distributions of engineers and nurses, as well as of Purdue and Sapienza students, across the teams. Once team membership was determined, fundamental knowledge was disseminated about how teams may be launched along a positive trajectory by preparing a charter detailing how the students would work together during their teams' life cycles. The teams applied this knowledge via an active learning activity where they prepared and signed a charter that would guide their collaboration during the program that culminated in their team project presentation. The following set of questions was provided to help guide their charter preparation:

- How will your team communicate throughout the week to complete the project?
- What roles will each team member take as part of the team?
- What are your collective expectations for grades, team member participation levels, timeframe for completing assignments, etc.?
- What other issues do you feel are necessary to discuss (and document) based on your experience working on teams?

The primary benefit of this activity is that the students collectively set expectations for the program and their collaboration. The secondary benefit is that the team members begin working together on a meaningful exercise in the first classroom session. Both benefits have been shown to facilitate effective team performance (Clark & Wheelwright, 1993; Kennedy, Vozdolska, & McComb, 2010).

The team project, which is delivered via presentations on the last day of class, provides an opportunity for students to demonstrate their significant learning across all of Fink's (2013) taxa. All

students were required to participate in the preparation and delivery of their teams' presentations. The team project instructions were designed to foster "learning how to learn." Specifically, the instructions provide general guidance about what is required in their final presentations. Students, however, were left to determine how best to meet the guidelines and how to collaborate to complete the presentation. Moreover, students had to overcome logistical difficulties in order to complete their presentations. Many of the Sapienza students live outside the city and both students had commitments during the day (i.e., Purdue students were touring cultural sites, Sapienza students were attending classes) that made finding common times to collaborate difficult. To overcome this issue, participants made extensive use of social media and other online collaboration tools, worked efficiently between program activities, and delegated work to subgroups. Additionally, programmatic changes in subsequent years helped to facilitate increased face-to-face collaboration by providing more time between program activities.

The team project instructions required students to address the following in their final presentations:

- The team's definition of "engineering services" and "public health" based on program activities as well as examples of engineering services and public health observed during the program (i.e., fundamental knowledge and application)
- A detailed description of one venue (each team is assigned a different venue) (i.e., application)
- Two opportunities for improvement at the assigned venue from engineering services and public health perspectives (i.e., application and integration)
- Two similarities and two differences observed across all venues (industrial and cultural) and how they relate to the lecture topics covered (i.e., integration)
- Four lessons learned through this program, including examples to demonstrate points (i.e., human dimension and caring)

Written report (Purdue students only)

Approximately one week after the Purdue students returned to the United States, a team written report was due that documented the material included in the team presentations. The teams were constructed by combining the Purdue students from two of the teams that were assigned to the same, or similar, venues (e.g., transportation above ground and transportation underground; St. Peter's Basilica and the Vatican Museums). Given the similarity between the presentation and written report, the significant learning opportunities are also consistent with those described in the previous section.

Oral examination (Sapienza students only)

Sapienza students were individually examined after the Purdue students left Rome. In these oral examinations, the students discussed the team project. Particularly, they were required to justify with technical and economic calculations any improvement measure their team conceived. For example, the teams may have suggested that restroom facilities were inadequate at a particular venue. In this case, the individual students were asked to extrapolate the expansion required based on the number

of visitors in different periods over the year. This approach demonstrates an integral component of Fink's (2013, p. 58) learning how to learn in that students "add[ed] to their own knowledge in ways that are specific to particular domains of inquiry." The other significant learning opportunities demonstrated in this assessment are foundational knowledge, application, and integration.

Assessment Analysis

Closing the loop in the constructive alignment processes requires reviewing actual student learning outcomes (Biggs & Tang, 2011). In Table 2, examples of learning outcomes are presented across Fink's (2013) taxa. Additionally, the links between these examples and the four program goals are indicated. The demonstration of learning outcomes are drawn from the array of assessment opportunities provided to students, as well as from the program evaluation tools administered at the end of the semester. The table highlights the breadth of student learning that occurs in this program, both across Fink's taxa of significant learning and the instructors' program goals.

Table 2. Examples of Actual Learning Outcomes across Fink's (2013) Taxa and Program Goals

		Program Goals			
		1	2	3	4
Foundational Knowledge	*Reflection by U.S. student:* "When I think of engineering, I think of services that look at an entire system and see how each component comes together to create one fluid structure that is constantly evolving. These systems can be small, such as the components of a vaccine that effectively work together to stop disease, or they can be large, such as an entire city built to promote sanitary living conditions. In a way, public health is like taking an engineer's approach to healthcare because it looks at the health of the entire population and how demographics, risk factors, and diseases are all interconnected. It then takes that information and figures out how to make changes that improve the entire system, not just one small part."	✔			
Application	*Oral examination of Italian students:* Students were required to apply their fundamental knowledge about, for example, maintenance and management opportunities for improvement. Specifically, each individual student was asked to (1) identify the best maintenance policy/strategy to be applied for the recommendations proffered in the team presentations and (2) quantitatively and qualitatively calculate the costs and benefits of their recommendations. The professor assessed the students' capability in approaching the problems and putting into practice their previous theoretical competences as ranging from good to very good.	✔			
	Reflection by U.S. student: In today's tour when going through the security entrance I saw a good example of reliability through redundancy. When we got inside into the security building there were many machines and scanners. This allows for more people to get through security faster and if one of the machines had broken the whole system wouldn't have failed. This is good redundancy because one problem does not cause a total system failure.	✔			
	Reflection by U.S. student: The lecture about processes relates to some things learned in the hospital today. They told us that as patients are coming in they separate them by color based on their level of need, and these codes for patients are red, green, and white. This process for receiving patients helps the hospital flow more smoothly and produce better results, which are to help the patients recover from injury or illness.	✔			
Integration	*Oral examination of Italian students:* Students demonstrated their ability to integrate both theoretical and cultural foundational knowledge in their individual oral examinations. A number of the students articulated the risks associated with incorporating innovative technologies (e.g., augmented reality); transforming one of the most important historical areas in the world into a commercial place may result in undermining tourists' opportunities to gain historical knowledge and experience Roman culture through immersion in the historical Roman *cives*.	✔			✔

	Passage in U.S. written report: Along with learning cultural differences, we also learned that our majors fit together almost like pieces of a puzzle. On our hospital tour we were able to see how engineers work to help maintain the equipment in which the hospital staff uses to treat its patients with. This demonstrates the harmonious relationship that our two majors have together. Throughout our time in Rome, we constantly reflected on how different aspects of engineering services such as: process flow, maintenance, and reliability, affect and can help to improve public health.	✔	✔	✔	
	U.S. student reflection: The most important thing I learned was the dependence of nurses on industrial engineers and how they are so vital to the healthcare system. Obviously maintenance is a major role of engineers that is connected to nursing, but I did not realize before this experience how engineering could be utilized to analyze the process flow of hospital systems. By utilizing industrial engineers, nurses can greatly improve the quality of care and efficiency of care that is being provided. Another lesson learned is that public health and engineering services are evident in everything. Once you begin to actually look for these things its obvious to see.		✔		
	U.S. student reflection: I learned so many things from this experience. I would say the most important lessons were about learning and adapting to a different culture. I got to experience firsthand Italian transportation, dining, education, and healthcare. I also learned the importance of teamwork and collaboration with students from another country and background than myself. From the lecture material, I now understand the importance and different methods of maintenance of historic structures. In addition, I learned how tourism can seriously affect and change a city and its population, often in negative ways. Finally, I learned how to integrate engineering services and public health, along with how to apply these concepts to daily life.	✔	✔	✔	
	U.S. student reflection: Finally, this experience showed me the value of interdisciplinary cooperation among healthcare professionals and engineers. Although the two professions have different educational backgrounds, bringing the two different perspectives together can result in innovative ideas.	✔	✔		
	Italian/U.S. student quotes from team presentations: "We learned to think about social problems and the relationship to engineering." "engineering coursework is relevant to social sciences/settings." "Nursing and engineering really do overlap." "how engineering services can harm or improve the health of the population." "Our majors are not as isolated as we think they are."	✔	✔		
Human Dimension	*Translated quote from Italian student program evaluation*: "The international . . . interaction with students of Purdue University on the theme of service engineering was culturally interesting and formative; it was one of the most beautiful experiences I have had in my cycle of studies."		✔		
	U.S. student reflection: "The most important lesson I learned is how to cooperate people with different cultures. I have a better understanding on "diversity" now and this experiences will definitely benefit me in the future when I doing businesses under multiple culture environment in the future."		✔		
	U.S. student reflection: I have observed that the Roman culture is much more laid back. They use as much time as they need. I see this as being a form of art. Art cannot be rushed and takes time and effort to make a beautiful work of art. Being in Rome, I feel like we have stuck with the fast-paced life so that we can get as many experiences as possible in one week as we can.			✔	
Caring	*Passage in U.S. written report:* Being in Rome, Italy was an amazing experience for everyone who attended the trip and participated in the program this spring break. It was also filled with a lot of lessons learned for all participants. While there we learned that our languages and cultures have similarities and differences, our majors are not as isolated as we thought, the value of old and historical structures, and that clear and frequent communication is essential for group work.		✔	✔	✔

	Comment on U.S. program evaluation: "Working with the Sapienza students was also a highlight and has greatly improved my international team collaboration skills. I also was very glad to have such a diverse group of American participants as I learned so much from their perspectives as well. As much as we didn't enjoy them, the reflective assignments really helped me to reflect and tie back everything I was learning both culturally and technically through the experience."	✔	✔	
	Italian program evaluation: The instructor stimulates/motivates interest in the subject (3.6/4).			
	U.S. program evaluation: Learning was more meaningful in this class than other classes I have taken (4.7/5).			
Learning How to Learn	*Passage in U.S. written report:* Traveling to Rome allowed our eyes to be opened to the numerous possibilities that this world has to offer. With the world becoming more and more intertwined every day; a global perspective is needed, so working with people from around the world can be done effectively. Working with the Sapienza students for a week gave us an extraordinary opportunity to learn more about the Italian culture and gave us skills that are limited or not available in the United States. We will all apply the countless lessons learned to our future classes, jobs, and those around us.	✔	✔	✔
	U.S. program evaluation: I was more motivated to learn in this class than in other classes I have taken (4.7/5).			

Conclusions

The purpose of this paper is to describe the administration of, pedagogy implemented in, and student outcomes associated with a short-term study abroad program that exposes engineering and nursing undergraduate students from the United States and Italy to an intercultural and interprofessional immersion experience. Indeed, by the end of the program, students demonstrated an understanding of how engineering services and public health are integrated, as well as how they can be identified and improved across a variety of venues. This understanding includes an appreciation for the historical beauty of Rome and respect for the achievements of those that came before, and a higher level of cognitive thought in that they can identify similarities across vastly different venues (e.g., the way in which tourists are routed through venues such as the Vatican Museums, how ancient Romans entered and egressed the Coliseum, and how the modern-day public transit system moves tourists and locals throughout the city). More importantly, however, students gain respect for colleagues from another culture and/or professional discipline, the ability to work collaboratively and deal with cultural and professional differences to achieve a common goal, and an appreciation of how intercultural and interprofessional involvement can benefit experiences and outcomes. These lessons will serve them well throughout their careers.

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