Designing a high-impact, short-duration sustainability-focused study abroad program for engineering students

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Keywords: study abroad, education abroad, travel, intercultural communication

Study abroad (SA) is widely known to have uniquely positive, short- and long-term impacts for undergraduate students, regardless of academic discipline. Broadly speaking, undergraduate students who participate in SA programs demonstrate enhanced global competence, critical thinking, problem solving, and communication proficiencies, as well as a more dynamic perspective of their major and future profession. Some research has shown that SA impacts students' short- and long-term professional paths and improves employment outcomes.

Although these well documented benefits align with the demands of engineering employers, the recommendations of international engineering federations, and ABET's mission and requirements, engineering students account for only 5% of SA students nationally, and 1.4% of SA students at the University of South Florida (USF). This gap can be attributed to a combination of institutional perspective and students' resultant concerns regarding course sequencing and summer internships. Additionally, some engineering professors and advisors perceive SA negatively and may deter students from pursuing SA opportunities.

In this paper we discuss the development, implementation, status, and future directions of a 1-credit sustainability- and intercultural-focused study abroad course designed by Drs. Joanna Burchfield and Jamie Chilton in the college of engineering at USF. The course is open to all engineering majors and levels. Students participate in three classroom meetings focused on intercultural communication (ICC) and cohort-building before traveling abroad over spring break, where they engage with researchers and practitioners during tours, site visits, and lectures. Using a combination of surveys and reflections from four cohorts, we discuss participants' pre- and post- trip assessments regarding their holistic understanding of sustainability, perceptions of their engineering disciplines, and their global, intercultural, and communication competencies. We assert that short-duration SA is an efficient, effective, and non-disruptive approach to providing engineering students access to the high-impact benefits of SA experiences. Additionally, our preliminary findings align with prior research showing that combined ICC instruction and SA can improve the Intercultural Development Inventory index scores among engineering students, who typically fall into ethnocentric levels of intercultural competence, thus increasing students' cultural awareness and openness to differences.

Future directions include: post-graduation follow-up among past participants, increased focus on ICC while abroad, and enhancing the participative opportunities for students who may not otherwise be presented with such possibilities for travel experiences.

Introduction

Engineers are increasingly working in cross-cultural and multi-disciplinary settings, where they are expected to thrive professionally by their employers. (Gash, Ressler, and Crispino, 2009). This growing demand highlights the importance of intercultural competence (IC), defined as "the complex abilities required to perform effectively and appropriately when interacting with others who are linguistically and culturally different from oneself" (Fantini, 2009, p. 458). IC has become essential for engineers' success in the globalized world (CTI, 2022; Rico-García & Fielden Burns, 2020). As a result, fostering IC in engineering students has become a priority in engineering education (CTI, 2022; Weisser, 2015). Study abroad is widely regarded as one of the most effective ways to enhance IC (e.g., Deardorff, 2006). Acquiring foreign language skills and developing intercultural communicative competence are two key benefits of studying abroad (Guo, 2015). Study abroad also boosts students' self-efficacy (Cushner & Mahon, 2002; Petersdotter, Niehoff, & Freund, 2017) and tolerance for ambiguity (Dewaele & Wei, 2013). Students gain greater intercultural awareness (Anderson et al., 2006) and an openness to the perspectives of others, ultimately becoming more systems-thinking engineers who recognize their role as global citizens (Clarke et al., 2009).

Despite the growing emphasis on study abroad programs in engineering education, engineering students have historically been underrepresented in these programs (Davis & Knight, 2018). Engineering students demonstrate lower participation levels in study abroad programs due to several common challenges specific to engineering students. First, engineering programs often have a rigorous curriculum with demanding coursework, making it challenging for students to find suitable study abroad opportunities without falling behind in their academic progress. Concerns about delayed graduation due to postponing engineering courses, credit transfer issues, or a mismatch in curriculum may dissuade engineering students from participating in study abroad programs. Study abroad programs also may not offer the specific engineering courses required for students to stay on track with their degree requirements. Some study abroad programs may also have language requirements, and engineering students may have limited language proficiency due to their focus on engineering

curriculum. Second, engineering students may prioritize gaining practical experience through internships or co-op programs, which are crucial for their future careers. Optimal times to engage in internships and co-ops can conflict with study abroad timelines. Third, engineering students often prioritize gaining specialized skills or knowledge in their field, and they may perceive study abroad programs as less beneficial for their career development compared to other academic pursuits. Fourth, some engineering students may not be adequately informed about study abroad opportunities or may lack guidance on how to integrate these experiences into their academic plans. Finally, engineering professors, advisors, and academic leadership may conceptualize study abroad programs as frivolous and unnecessary vacations, and deter students from participating in traditional study abroad experiences. While some programs have developed short-term study abroad experiences spanning a single 15-week semester or 6-week summer session, thus reducing interference with degree progression, even these short-term experiences are considered too long by many engineering faculty and administrators, and engineering students rarely participate. In an attempt to remove some of the aforementioned deterrents and make study abroad opportunities more accommodating to engineering students, we developed an extreme-short-term study abroad course specifically designed for engineering students with the intent of maximizing intercultural impact over the duration of spring break. The objective of this work in progress paper is to examine whether there is an observable increase in students' IC even after one week of study abroad.

The University of South Florida (USF) College of Engineering (CoE) Global Engineering study abroad program is collaboratively designed, led, and taught by two faculty members, communication faculty Dr. Joanna Burchfield and engineering faculty Dr. Jamie Chilton. In the CoE, Dr. Burchfield comes from a background in health communication and teaches through a lens of interpersonal and intercultural communication as part of traditional engineering courses. Dr. Chilton is a biomedical engineer and teaches undergraduate and graduate courses in the department of Industrial and Management Systems Engineering. The Global Engineering study abroad program was stablished by USF College of Engineering Dean's Office in Fall 2021; USF had no prior education abroad programs designed specifically for engineering students. The program was designed to take place over Spring Break to not interfere with student degree progression or summer internships and co-ops. The initial travel destination chosen was to Berlin & Munich Germany, with the first cohort to travel to Germany in Spring 2022. However, the goal is to rotate travel destinations every 1-3 years. The 2025 location is Costa Rica. The program was originally an embedded model for the first cohort, where only students enrolled in already established engineering courses were eligible to participate. This model was quickly changed to benefit a broader range of engineering students of all degree levels in terms of completing elective credits and showcasing their experience on their academic transcript. Starting with the second cohort, the program exists as a standalone 1.0 credit course for all engineering majors (and any interested physical and social science majors) at all degree levels that can count toward fulfillment of technical elective credits across engineering majors. The single credit provides students with flexibility to use as a single additional credit needed to achieve full time status for the semester, or to fulfill a single missing credit hour of technical electives. The program focus is a systems-thinking approach to Sustainability with particular emphasis on students' roles as engineers and global citizens to address the 17 UN Sustainable Development Goals. Since its inception, there have been three cohorts (Spring 2022, Spring 2023, Spring 2024) which have traveled to Berlin and Munich, Germany.

We hypothesize that short-duration education abroad is a highly efficient, effective, and non-disruptive approach to providing engineering students with the benefits of a study abroad program and significantly improving their interpersonal and intercultural communication competency.

University of South Florida Education Abroad Program Methods/Implementation
The Engineering Education Abroad Program at the University of South Florida (USF) is a one-week, short-term education abroad program founded in 2021 and offered annually over spring break each spring semester. The program had its first cohort in Spring 2022, traveling to Berlin and Munich, Germany. A total of three cohorts – Spring 2022, Spring 2023, and Spring 2024 – have traveled to the same destination of Berlin and Munich, Germany. Travel abroad is accompanied by a 1.0 credit academic course in the spring semester called "Global Engineering", co-taught taught with an interdisciplinary instructional team comprised of CoE faculty including communication professor Joanna Burchfield and engineering professor Jamie Chilton from the Industrial and Management Systems Engineering Department. The Engineering Education Abroad Program is open to all engineering majors in the college at both undergraduate and graduate degree levels. Total enrollment each semester ranges from 15 – 25 students with a program maximum of 25 students. Figures 1, 2, and 3 depict the engineering major, gender, and degree level composition of the three Germany cohorts (Spring 2022, Spring 2023, and Spring 2024).
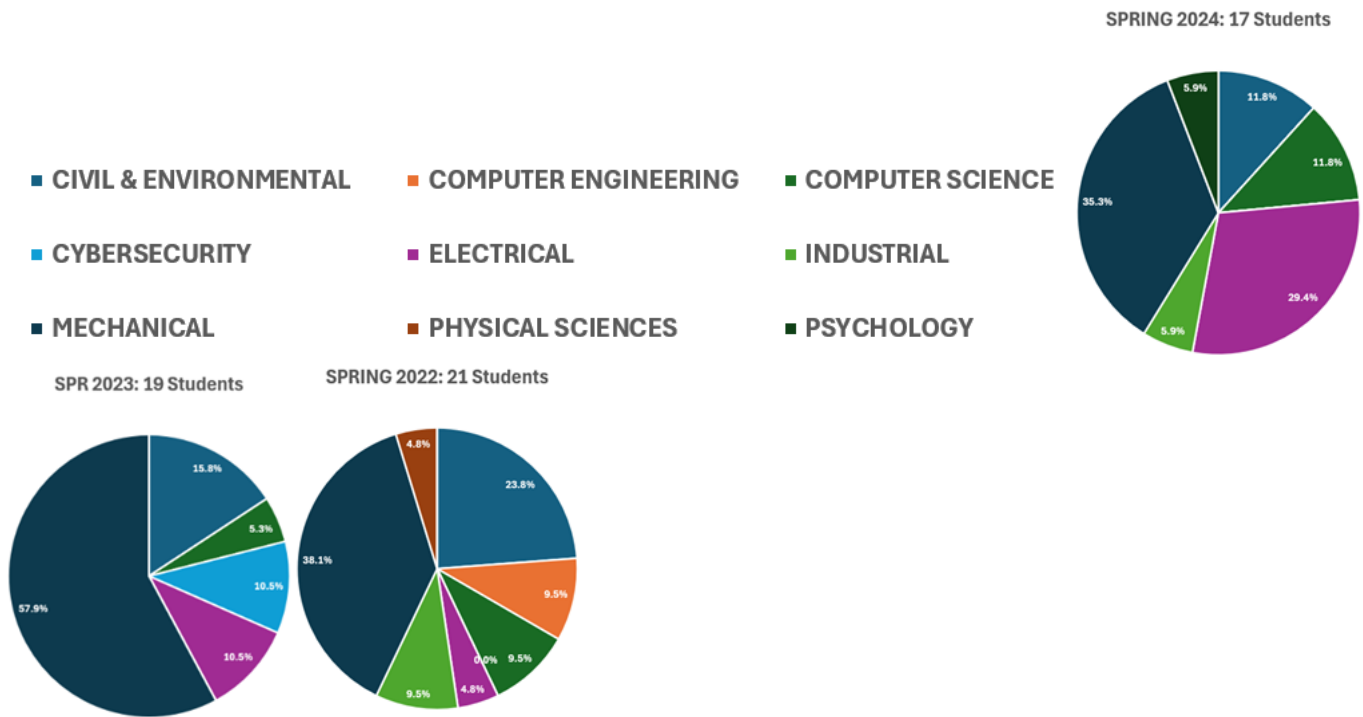
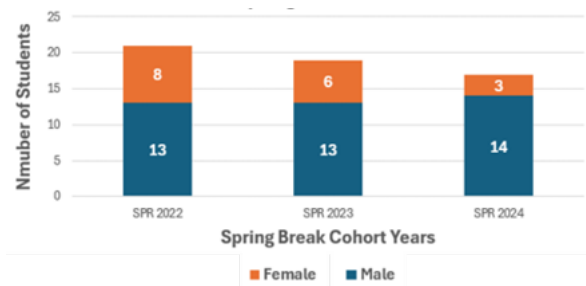**Figure 1.** Engineering Major Composition of Spring Break Cohorts traveling to Berlin and Munich Germany.

Figure 2. Number and Gender Composition of Spring Break Cohorts traveling to Berlin and Munich Germany.
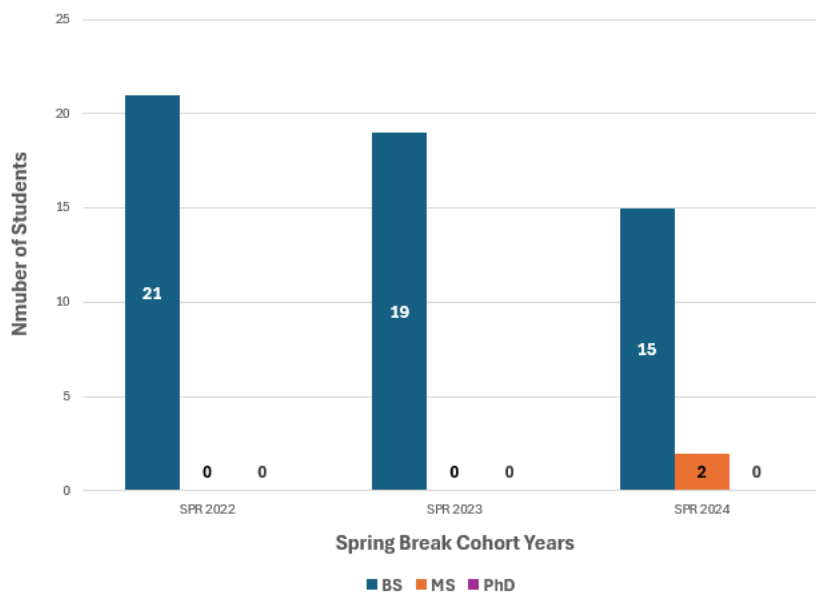

Figure 3. Degree Level Composition of Spring Break Cohorts traveling to Berlin and Munich, Germany.

The program and accompanying 1.0 credit course take a systems-thinking approach to the topic of sustainability and intercultural communication, and students are assessed both pre- and post-travel. Prior to travel over spring break to Germany, students enrolled in the program are required to attend three student/faculty meetings (Figure 4). During these meetings, students engage in team-building activities and participate in lectures discussing German culture and the impacts of culture and co-culture on communication. In 2024, a new team problem-solving activity was added, wherein students work in teams to solve a sustainability-based scenario (see Figure 4). Each student team designs and shares a novel engineering solution based on their current understanding of sustainability and culture prior to travel. Each individual student is also asked to complete a pre-trip self-reflection (see Figure 4 and Appendix A). To keep sustainability and intercultural communication at the forefront during their travels, students documented their experiences and conversations with people in Germany using notes, photos, and videos in travel journal assignments for each city visited (see Figure 4). Upon return to the United States, students attended a final student/faculty meeting to debrief on the entire trip and process their experiences. Students were asked to revisit the same sustainability scenario with their teams to discuss any changes in their approach and engineering solutions. Students also completed their final individual Post-Trip Reflection (see Figure 4 and Appendix A).

Figure 4. Timeline of Program and Student Assignments.

Blinded qualitative thematic assessment was conducted on the final individual student self-reflection responses post-travel. The authors independently identified emergent themes in student responses and cross-referenced their results. Themes that were agreed to be very similar or referred to the same subject were combined.

Results
Upon return to the United States after their travels in Germany, students and professors met to debrief and process their experiences. Students were asked to complete a Post-Travel Self-Reflection assignment to describe their travels, assessment of German culture, and their conceptualization of sustainability (see Appendix A for Post-Travel Self-Reflection assignment questions) and its impacts on their engineering perspectives. In particular, students were asked about their greatest/most impactful take-aways from their trip. 100% of all students completed the self-reflection assignment. Student responses to the self-reflection assignment were blinded and qualitatively coded and analyzed for the emergence of broad themes and theme subcategories describing the students' experiences and insight. Therefore, a total of 57 unique response statements across three cohorts (see Figure 3) were analyzed. Broad Theme categories were identified for each cohort, with each Broad Theme comprised of several subcategories of themes. All broad themes and theme subcategories identified in student responses are listed in Table 1, Table 2, and Table 3 for each cohort respectively, while Table 4 depicts common cross-cohort trends. Some unique response statements reflected more than one theme subcategory.

Summary of Self-Reflection responses:
Spring 2022 Cohort:
Students in the 2022 cohort offered detailed reflections on German culture, often emphasizing its collectivist orientation, systemic efficiency, and embedded commitment to sustainability. Many contrasted the societal cohesion and public-mindedness they observed in Germany with more individualistic norms in the United States, particularly in relation to public behavior, infrastructure, and shared responsibility. The pace and orderliness of German life—especially the punctuality of transportation systems and adherence to social protocols—stood out as core cultural features.

Sustainability emerged as a defining theme across student responses. Students noted that environmental practices such as recycling, green infrastructure, and walkable cities were not isolated efforts but integrated into German daily life. This visibility prompted a reevaluation of the concept of sustainability itself, with several students expanding their definitions

to include social well-being, governance, and long-term systemic planning. Transportation systems were widely praised as examples of design that promote both environmental and social sustainability.

Many students described moments of intercultural learning as they navigated language differences, unfamiliar norms, and communication barriers. These experiences often led to greater self-awareness and prompted students to reflect on their own assumptions and behaviors. In particular, students noted that traits they had previously interpreted as unfriendly—such as quietness or directness—were better understood in context as cultural expressions of respect, order, or personal privacy.

Students also reflected on Germany's public reckoning with its history, describing how civic memory and cultural heritage are openly integrated into public life. Several commented on the contrast between Germany's historical transparency and current U.S. debates over education, public memory, and identity. While few students explicitly connected their experiences to long-term career goals, many reported personal growth in the form of increased adaptability, intercultural sensitivity, and a broadened awareness of global systems and policy alternatives.

Table 1. 2022 Emergent Themes and Representative Student Quotes

Theme	Description	Representative Quotes
Collectivism and Social Cohesion	Students recognized ingrained cultural emphasis on collective responsibility, social trust, and mutual respect that contrasted with American individualism.	"Germans tend to operate as a collective more and don't strive to stand out or be individualistic." "Although everyone kept to themselves, there was a greater emphasis on the collective rather than the individual. A good example was the Autobahn... it would not be functional or even remotely safe if it were not for everyone's mutual respect."
Structure, Efficiency, and Punctuality	Germany was described as highly ordered, with an efficient pace of life where systems, public behavior, and infrastructure function with precision and reliability.	"German culture is very fast paced and structured. Everyone seemed to be in a rush to get to their destination with little room for improvisation." "I noticed... strict adherence to certain social norms... like bike lanes, keeping voice volume down." "The trains and buses had a very quick load and unloading time."
Reframing Assumptions Through Daily Interactions	Many students confronted and revised their preconceptions by observing quiet public behavior, limited small talk, and a reserved communication style.	"People were quiet on trains and buses and rarely called attention to themselves." "I thought that Germans would be loud and maybe a little obnoxious... it seemed more that we were the loud ones." "We were always the loudest ones on the train... an American inside voice is nearly shouting by German standards"
Sustainability as a Way of Life	Sustainability was seen not as an isolated environmental concern but as an integrated societal value spanning infrastructure, policy, and daily habits.	"The sustainability in Germany is out of this world. They focus a lot on green and renewable energy to improve their way of life."" In Germany, I believe [sustainability] can be seen... and how it impacts their community.""We should stop focusing on what's best for 'me'... and start building on what would be best for our country and our planet."
Transportation and Urban Design	Efficient, clean, and people-centered public transit and urban design were frequently cited as major contrasts to car-centric American systems.	"Only once on the trip did I ever see a traffic jam. People really did rely mostly on public transportation and biking.""I enjoyed the lifestyle of walking everywhere and not relying solely on cars to get around.""Walking and bike riding was friendly for those participants and others, like cars. Their systems just seemed efficient for all."
Cultural Memory, History, and National Accountability	Students were struck by how openly Germany acknowledges its past, using history as a tool for collective learning, accountability, and growth.	"They don't shy away from teaching about their history... they maintain memorials, learning centers, & landmarks to educate their children.""Germans seemed to be cognizant of their past. There was public attention on the Ukraine situation, particularly comparisons of Putin to Hitler.""German culture promotes consideration and politeness much more than American culture."
Intercultural Communication and Adaptation	Navigating language barriers and unfamiliar norms led students to reflect on how they adapted their communication styles in new cultural contexts.	"Germany seemed much more collectivistic than America, so accommodating for that was important.""Nonverbal communication helped a lot... I still stuck out though because of my race, height, and build.""My worry about the stereotype of Americans being loud made me speak in much lower volumes than normal."
Self-Awareness, Bias Recognition, and Growth	Students recognized their own assumptions and behaviors, especially in response to cultural dissonance/surprise.	"We stood on the entire width of the escalator, whereas the Germans stuck to the right.""I was a little put off by how friendly everyone was... until I realized that the people we were meeting with were genuinely nice"
Education, Labor, and Systemic Support	Students noted Germany's strong social systems—including education and healthcare—and saw them as essential for long-term sustainability.	"Germany is very progressive about its people and economy... traditional, but also susceptible to change.""My definition of sustainability broadened when I learned about German laws and policies regarding healthcare and education.""They care about worker's rights and human rights... and they don't shy away from teaching about their history."

2023 Cohort Reflections:

Students in the 2023 cohort described German society as highly collective and systematically organized, often contrasting it with the more individualistic norms they associate with the United States. Public infrastructure, particularly the transit system, was praised for its accessibility, reliability, and environmental integration, prompting several students to reflect on the limitations of comparable systems in the U.S. Cultural observations often centered on social restraint, rule adherence, and expectations around personal conduct in public spaces, which challenged students' assumptions about German formality and perceived aloofness.

Sustainability emerged as a deeply embedded societal ethic, with students noting that practices such as energy conservation, water purity, recycling, and walkability were not framed as special efforts, but as integral parts of everyday life. This led many to expand their understanding of sustainability beyond environmentalism to include population health, education access, and long-term social infrastructure. Intercultural communication themes were prevalent, with students reflecting on differences in conversational style, tone, and nonverbal expression, as well as how their own behaviors were perceived in the host culture. These experiences often prompted intentional adaptation and greater cultural humility.

Several students also remarked on Germany's visible commitment to historical education and civic accountability, particularly in relation to memorials and public narratives around the past. While few reflections focused directly on professional identity, many students expressed an increased interest in comparative policy, infrastructure, and system-level solutions. A recurring theme across the cohort was the idea that Germany's public systems reflect a shared societal commitment—something that several students hoped to see more fully embraced in the United States.

Table 2. 2023 Emergent Themes and Representative Student Quotes

Theme	Description	Representative Quotes
Collectivism and Social Infrastructure	Students consistently described Germany as a society built on trust, mutual responsibility, and collective well-being, with public systems reflecting shared values.	"Germans live their lives in a more collectivist fashion... respect they have for each other in all regards.""They have strong Western and Christian values... but people simply expect things to work — public transport, timeliness, and cleanliness.""They are more united in the sense of where they are trying to go and how to improve things for the next generation.""Interacting with a society based around collectivism was refreshing... I tried to blend in as much as possible."
Reframing Assumptions Through Daily Interactions	Many students reflected on how their assumptions about German people and social behavior—especially around formality, friendliness, and openness—were complicated or contradicted by their lived experiences.	"German people don't like bothering people... but they are also very vocal about their opinions.""I don't think I saw a single person jaywalk or skirt any sort of rule... Germans are very straightforward.""It felt a bit strange in Germany to begin with... but actually felt very comfortable as I got used to it.""They have such an impressive culture... and the people know their culture and are avoiding making the same mistakes that happened in their history."
Sustainability as a Lived Ethic	Students described Germany's approach to sustainability as deeply embedded in infrastructure, daily habits, and long-term thinking—beyond just recycling or environmental branding.	"Embracing sustainability is a lifestyle that impacts everything you do." "Escalators turn on/off automatically... tourism funds preserve museums... sustainability applies to both earth and people." "After learning about sustainability there, I have a different understanding of it.""It includes food, shelter, poverty, and homelessness.""Sustainability is focused on the longevity of the population." "Germany's unity on the sustainability front comes through in renewable energy, waste management, and technological development."
Transportation and Built Environment	Public infrastructure—especially clean, accessible public transit and pedestrian-friendly design—was widely praised as a marker of societal efficiency and care.	"From using public transportation in big cities to recycling soda bottles... less environmental waste." "Public transit that goes nearly anywhere... reusing of glass soda bottles." "Almost everyone opted for dark and muted colored clothing."
Intercultural Communication and Self-Awareness	Students became more conscious of their own verbal and nonverbal habits, and many actively worked to adapt or reflect on how they were perceived by others in Germany.	"As an American, I find myself being very loud sometimes... I would see people looking over at me." "Germans are very open... Americans try not to offend, but Germans try to be efficient in conversation." "I can see why the Black guy we ran into on the tram was frustrated... no one would speak German to him." "In Germany... had to maintain eye contact and not put our hands in our pockets." "Interacting with Germans was easier because they could see I was trying to fit in."

Theme	Description	Representative Quotes
Cultural Memory and Civic Responsibility	Students noticed how historical memory and civic ethics are integrated into everyday life—through museums, conversation, and public practices that reflect a collective social conscience.	"Buildings such as restaurants and urban transportation centers have been there for hundreds to thousands of years." "They value their history, and rather than hiding it, they see it as a reminder to prevent it from happening again." "They are avoiding making the same mistakes that happened in their history."
Education, Health, and Systemic Support	Germany's social systems—including education, healthcare, and worker protections—were consistently praised for contributing to a more stable, equitable society.	"As soon as a child is born... receives health insurance automatically." "German sustainability is focused on the longevity of the population... clean water, education, healthcare... all contribute to quality of life." "Education is seen as a right... you can go to university for whatever you would like."

2024 Cohort Reflections:

Students in the 2024 cohort frequently described German society as structured, cooperative, and underpinned by a strong sense of collective responsibility. Many commented on the widespread public trust in institutions and civic systems, contrasting this with the skepticism or individualistic orientation they often associated with American culture. Routine experiences—such as waiting for public transportation, navigating urban environments, or participating in daily errands—became opportunities for reflection on how social cohesion and shared expectations shape everyday life. Students consistently praised Germany's infrastructure for being not only functional but intuitively designed to serve the collective, and several noted how stress was reduced in environments where systems operated reliably and people honored common norms.

A broad understanding of sustainability emerged as a central takeaway for many students. Rather than seeing it as an individual responsibility or environmental buzzword, students came to view sustainability as a guiding principle embedded in public design, government policy, and social behavior. Reflections pointed to clean and efficient transportation systems, resource-conscious consumer practices, accessible healthcare, and livable cities as evidence that sustainability was treated as a cultural value rather than a niche concern. In this context, several students reconsidered the perceived limitations of U.S. infrastructure and environmental discourse, expressing a growing awareness of the structural dimensions of sustainability.

Cross-cultural learning featured prominently in students' reflections. Many recounted moments when German norms—such as reduced small talk, lower public volume, or different expressions of politeness—prompted discomfort or confusion, only to later be recognized as valuable cultural insights. These encounters frequently led students to adapt their own behaviors and develop greater sensitivity to interpersonal differences. Germany's candid engagement with its historical past, especially in relation to World War II, was also noted as a powerful example of cultural transparency and national maturity. Students expressed admiration for the country's willingness to acknowledge and learn from historical wrongs, often comparing this approach to debates over education and memory in the United States.

Although relatively few students linked these insights directly to future professional plans, many described a heightened sense of self-efficacy, intellectual curiosity, and a desire to continue exploring global systems and perspectives. For some, the experience revealed that alternative models for organizing public life are not only possible but already functioning elsewhere—provoking a reevaluation of what they had previously accepted as inevitable or "normal" in their own society.

Table 3. 2024 Emergent Themes and Representative Student Quotes

Theme	Description	Representative Quotes
Collective Responsibility and Social Trust	Students observed that Germany's societal structure emphasizes shared responsibility, mutual trust, and a deep commitment to the common good, often in contrast with American norms.	"Germany is a country that runs on the belief that everyone should do their part... there is this widespread understanding that everyone needs to work together." "It felt like people trusted each other more there... people seemed to just do the right thing even when no one was watching." "You're expected to follow the rules... not because someone is watching you, but because that's what you do. It's more like a moral contract with society."
Sustainability as Interconnected Practice	Students expanded their definitions of sustainability after encountering Germany's integrated systems for environmental, economic, and social well-being.	"Sustainability wasn't just about recycling or saving energy. It was also about how the city was designed... and how people thought about long-term impact." "In Germany I saw how it also means maintaining a livable, functional society—public transit, housing, health care—everything." "The idea that sustainability is about systems, not just individual habits, was a big shift for me."

Theme	Description	Representative Quotes
Transportation, Walkability, and Urban Planning	Germany's efficient public transit, bike infrastructure, and walkable cities were some of the most positively noted experiences, often contrasted with U.S. dependency on cars.	"I didn't ride in a car the entire time I was there... It made me realize how limited we are in the U.S. if you don't drive.""Everything felt connected and accessible... It was just easy and normal to get around without a car.""People biked in suits and dresses—like it was just part of life, not a separate activity."
Reframing Cultural Assumptions	Students reflected on how their preconceptions about German people and culture—especially around personality, warmth, and social openness—were revised during the trip.	"I thought Germans would be cold or unfriendly, but honestly most of the people we met were super kind and helpful.""There's a difference between being unfriendly and being private. Germans are just more private, but that doesn't mean they don't care.""I had this stereotype... but people actually joked around and had fun—just in a more low-key way."
Cross-Cultural Etiquette and Reflective Adaptation	Students became aware of differences in social norms—such as volume, eye contact, or spatial awareness—and reflected on how they adjusted their own behavior to fit the cultural context.	"I didn't realize how loud I usually talk until we were on the train and I saw people looking over.""It was weird at first that people don't really smile or do small talk... But once you accept that, it's actually kind of relaxing.""I had to pay more attention to nonverbal stuff—like standing to the side on the escalator, or how close you are to someone in line.""I noticed I was doing the whole 'excuse me' or smiling thing... but they just express politeness differently."
Historical Reckoning and Cultural Transparency	Germany's open engagement with its past—through museums, memorials, and cultural discourse—stood out as a model of national accountability and collective memory.	"They don't try to hide their history... The Holocaust sites and WWII stuff were presented honestly.""There's a kind of national maturity in being able to say, 'Yes, we did terrible things, and here's what we've learned.'""The history was everywhere... It wasn't hidden, but it also wasn't glorified. Just part of life."
Reflection on U.S. Systems and Policy Gaps	Experiencing German systems led many students to critically reflect on infrastructure, healthcare, education, and civic culture back home.	"Being there made me realize how much we put up with in the U.S. because we think it's normal.""It really hit me how much more relaxing it is when systems work... It just worked.""I kept thinking—if they can do this, why can't we? Like healthcare that doesn't bankrupt you... or trusting your neighbors."
Personal Growth and Increased Global Curiosity	Students described new levels of self-awareness, independence, and curiosity about the world—some framing the experience as transformative for their worldview.	"This trip made me want to travel more, not just for fun but to learn. I feel like I've been living in a bubble.""It pushed me to be more adaptable... Now I feel more capable.""I came back thinking differently about what's possible... maybe we don't have to accept things just because they've always been that way."

Cross-Cohort Observations

Across all three cohorts, students consistently described Germany as a society grounded in cooperation, environmental responsibility, and well-functioning public systems—features often contrasted with students' perceptions of American individualism and institutional inconsistency. Themes such as sustainability, transportation infrastructure, and trust in civic institutions surfaced repeatedly and across years, prompting students to reevaluate not only cultural stereotypes but also their assumptions about what is structurally possible within national systems. German approaches to urban design, public etiquette, and environmental stewardship were not viewed as aspirational ideals but as normalized practices that support long-term societal wellbeing.

While the 2022 cohort emphasized moments of cultural surprise and contrast—particularly in relation to social norms, quiet public behavior, and visible sustainability—the 2023 and 2024 cohorts demonstrated a growing tendency toward structural critique. These later cohorts more frequently drew connections between what they observed in Germany and the limitations they perceived in American healthcare, education, infrastructure, and historical discourse. In all three years, students reported meaningful personal growth, including increased confidence, intercultural awareness, and a desire to continue engaging with global systems and perspectives. As a collective dataset, these reflections suggest that even short-term immersion experiences can provoke critical insight into the relationship between culture, policy, and everyday life.

- *2022 Cohort: Cultural Contrast and Discovery*
  - The 2022 cohort often framed their experiences in terms of cultural contrast and discovery. Their reflections emphasized the novelty of encountering different norms—particularly around quietness, punctuality, and behavioral expectations—and a sense of initial cultural disorientation. Sustainability was recognized as a visible and impressive element of German society, though often described in environmental rather than systemic terms. Intercultural communication was approached from a personal perspective, with students navigating language barriers and adjusting to unfamiliar social cues. While many students demonstrated increased self-awareness, references to U.S. policy, civic systems, or historical memory were generally limited or implicit.

- *2023 Cohort: Structural Awareness and Civic Comparison*
  - The 2023 cohort demonstrated a more explicit engagement with the structural dimensions of German society. Sustainability was no longer framed merely as "green" practice but as a holistic system involving public health, education, and social equity. Students in this cohort more frequently compared their experiences abroad with American institutions, often articulating frustrations with domestic systems related to healthcare, transit, or historical denial. Cultural humility continued to emerge through interpersonal encounters, but many students also situated their learning in broader societal frameworks. Reflections on Germany's engagement with its own history were especially prominent, indicating a shift toward deeper civic analysis.
- *2024 Cohort: Systems Thinking and Sociocultural Integration*
  - In the 2024 cohort, themes of systems thinking and societal integration came into sharper focus. Students moved beyond admiration or critique to articulate how German infrastructure, cultural values, and public trust were interdependent and mutually reinforcing. Sustainability was described not only as embedded practice but also as a cultural orientation—a way of living that encompassed efficiency, equity, and long-term thinking. Students expressed awareness of emotional and psychological dimensions of public systems (e.g., reduced stress, higher trust), and several explicitly questioned what they had previously accepted as "normal" in the U.S. While still grounded in personal growth, this cohort's reflections were marked by a heightened sense of global curiosity, comparative thinking, and a willingness to imagine systemic alternatives.

Table 4: Comparative Thematic Trends Across Cohorts

Theme	2022	2023	2024
Collectivism and Social Cohesion / Trust	Students admired Germany's collective mindset and mutual respect, contrasting it with American individualism.	Emphasis on societal trust, shared responsibility, and public systems that reflect collective well-being.	Viewed social trust and "moral contract" behavior as embedded in norms; expectations to follow rules for the greater good.
Sustainability as Cultural Practice	Sustainability expanded beyond environment to include labor, health, and infrastructure; seen as a visible, lived value.	Seen as intergenerational and systemic—part of identity, infrastructure, and public ethics.	Understood as an interconnected system supporting livability, equity, and long-term well-being—beyond branding or habits.
Transportation and Urban Infrastructure	Efficient public transit and walkable design inspired admiration and critiques of U.S. car dependency.	A marker of sustainable, people-centered infrastructure; praised for ease, quality of life, and accessibility.	Biking, walking, and integrated transit were described as "just part of life"; few students used cars at all.
Reframing Assumptions and Stereotypes	Many students challenged their preconceived ideas of German formality and reserve, noting unexpected warmth.	Reflections on formality, humor, and emotional restraint; recognition that privacy ≠ coldness.	Further reframing: initial assumptions about coldness were revised after positive, if subtle, social experiences.
Intercultural Communication & Self-Awareness	Greater awareness of loudness, personal space, eye contact, and how cultural etiquette shapes perceptions.	Students reflected on adjusting tone, posture, and interactional expectations in public.	Many acknowledged unlearning American norms like small talk or public friendliness; learned to interpret new cues.
Historical Awareness and National Memory	Museums and monuments spurred reflections on Germany's public accountability and contrast with U.S. historical silence.	Germany seen as a model for confronting the past; memory embedded in everyday spaces and discourse.	Cultural maturity noted in honest engagement with history; history was "present but not glorified."
Social Systems (Health, Education, Labor)	Praised for contributing to quality of life and equity; sustainability seen as institutional, not just environmental.	Students contrasted U.S. gaps in health care and education with Germany's structural support.	Realization that functional systems reduced stress and created social trust—"it just worked."
Personal Growth and Global Perspective	Students described growth in civic responsibility and professional ambition.	Shift toward new definitions of success: contribution, sustainability, impact.	More students expressed desire to travel for learning, not just leisure; expanded worldview and adaptability.

Faculty Reflections

While there are certainly many factors that contributed to the seeming increase in cohorts' levels of critical thinking, intercultural competence development, and systems thinking tendencies, we believe that there are some notable programmatic differences between years that likely influenced how students engaged and made connections during their time abroad.

- ***Faculty Knowledge***: With repeat visits to the same cities in Germany, and in some cases working with the same guides or lecturers in consecutive years, we gained experiential knowledge and insight as faculty leads that could be shared with students prior to the trip abroad. Additionally, our experiential knowledge allowed us to navigate systems and infrastructure in Berlin and Munich with increasing familiarity, which in turn made us capable of providing students with explanations and instructions that helped set expectations. As a result, students from the 2023 and 2024 cohorts could spend increasing energy on interpreting and relating systems because they didn't have to spend as much time simply observing the systems just to figure out what was going on.
    - For example, in 2022, the dedicated bike paths on sidewalks were as new to us as they were to the students, so we were all observing and learning at the same rate. However, in 2023 and 2024, we made sure to brief students about the dedicated sidewalk bike lanes prior to the trip, before we left the hotel in Berlin for the first time, and, with one of us in front and one behind the group of students throughout the days, we led by example *and* repeatedly reminded them to get out of the bike lanes. This freed up space for the students to think more about what the infrastructure meant for the German people and their systems because they were 1) being made to pay attention to it the whole time, and 2) they were less frequently finding themselves in the paths of fast moving bicycles than the 2022 cohort.

  Additionally, our trip in 2022 was the first time either of us had led students abroad. With each new cohort, our confidence as faculty leads has increased, and we have each found that our ability to guide and attend to the needs of students abroad has grown and matured. As a result of our increased confidence, the students also feel more confident, not only because the confidence of leadership is often translated as competence, but also because our confidence as travelers makes the prospect of going to a new place less scary, especially if a student has never been abroad.
- ***Updated Predeparture Instruction***: We have updated our predeparture instruction each year based on our experiences and student feedback from prior years, which has likely resulted in students feeling more prepared to engage deeply with their experiences abroad.
    - For example, every year we have used Hofstede's cultural dimensions to discuss some of the basics of cultural systems. However, in 2022, lecturer John Davis in Germany gave a powerful lecture to our students and used Hofstede's dimensions as part of his lecture. The students seemed to get a lot from it, so in subsequent years we started spending a little more time on connecting Hofstede's cultural dimensions to cultural perspectives and systems.
    - Additionally, in 2024, we introduced a new team problem-solving activity. During one of the pre-departure meetings, students worked in teams to solve a sustainability-based scenario. Because of our prior knowledge of Germany's infrastructure, and because students are faced with traffic issues in Tampa and traffic and parking problems on the USF Tampa campus every day, we posed the students with a transportation-based scenario. It is notable that the 2024 cohort observed and interpreted Germany's infrastructure through a critical lens and engaged in systems thinking with regard to the interplay between culture, infrastructure, policy, equity, and accessibility.
- ***Updated/Modified Itineraries Abroad***: We have also updated our itineraries abroad based on experience and student feedback.
    - The 2022 cohort craved more cultural experiences, and noted that they wished they were more familiar with the layout of the cities at the start of the trip. So, for the following years, we added walking tours of each city on the first days, and added a trip to Stasi Prison, which was incredibly impactful for students.
    - There have also been times when excursions were not available in all years. For example, in 2022, our excursion to the BMW plant was cancelled mere weeks before our trip because the plant shut down due to the start of the Russian war on Ukraine. The 2023 cohort got to go to the plant and loved it, but then in 2024 BMW was not booking tours for the time we were in Germany.
    - We have also dropped excursions from our itinerary in the event that they seemed to lack value or provided inconsistent value to students. For example, in 2022 we took students to the Berlin Wall Memorial for a guided tour and had an incredibly impactful tour with an excellent tour guide. In 2023 we took students to the Berlin Wall and the Stasi Prison, and while the Stasi Prison tour was incredible, the Berlin Wall tour was very poorly done and included inaccurate information (which we knew because of our tour there the previous year and because of our Stasi Prison tour earlier that day). The 2023 cohort told us that because they Stasi Prison tour covered a lot of information about the Berlin Wall, and because the Prison tour was so much more informative, they felt that future cohorts would benefit more from a guided tour of the Prison, followed by a self-guided tour of the Berlin Wall. That worked well in 2024.

Discussion

Across three years of reflection data, students consistently described Germany as structured, cooperative, and rooted in collective responsibility. Recurring themes included sustainability as a systemic norm, efficient transportation as a cultural value, and social trust as foundational to public life. While experiences varied, students across cohorts indicated increased intercultural awareness, critical thinking, and personal growth through their everyday observations, experiences, and cross-cultural engagement during their time abroad.

One of the most consistent learning outcomes was the reframing of assumptions—particularly around social behavior, public etiquette, and interpersonal norms. Traits initially perceived as cold or rigid were later understood as culturally grounded expressions of privacy, efficiency, and mutual respect. This shift often led students to reflect on their own behaviors and adapt accordingly, suggesting growth in intercultural communication competence.

Students' responses indicate that short-term study abroad experiences can meaningfully strengthen students' intercultural communication skills and also support some ABET student learning outcomes (SLOs). For example, SLO3, *"communicating effectively with a range of audiences"* was evident in students' awareness of how their communication styles were received in Germany and their willingness to adjust tone, volume, and body language. Reflections that focused on infrastructure, public health, and sustainability indicated that students were thinking in ways that are consistent with ABET SLO2, *"design solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors."* Finally, students frequently drew comparisons between German and U.S. systems, and assigned value, meaning, and moral and ethical responsibilities (or lack thereof) to those systems, demonstrating *"an ability to recognize ethical and professional responsibilities... and make informed judgments... in global, economic, environmental, and societal contexts"* (ABET SLO 4). These reflections often extended beyond cultural difference to encompass systems-level thinking about equity, access, and engineering practice.

Cohort-specific trends suggest an evolution in depth and focus over time. The 2022 cohort emphasized cultural novelty and adjustment. By 2023, students were drawing more explicit policy comparisons and expressing structural critiques. In 2024, students began to articulate how culture, infrastructure, and public trust are mutually reinforcing—demonstrating deeper systems thinking and a broader global perspective.

Transportation systems emerged as a particularly interesting site of analysis. Students across cohorts consistently pointed to Germany's trains, trams, bike lanes, and pedestrian infrastructure as both functionally impressive and socially illuminating. Such encounters prompted many students to consider how infrastructure reflects cultural values, such as collective efficiency, respect for public space, and trust in institutions. Transportation also served as a point of comparison between German and U.S. systems, where students expressed frustration with transit access, reliability, and the lack or privatization of basic services.

This theme also highlighted cohort-specific differences in intercultural communication competence and depth of critical and systems thinking:

- Student quotes from the 2022 cohort praised German transportation efficiency with positive surprise and appreciation, and indicated early comparative thinking:
  - "You could get almost anywhere without a car. It made me wonder why we don't have that at home."
  - "Trains were on time, clean, and easy to figure out — way better than I expected."
  - "It felt nice to walk so much and not worry about parking all the time."
  - "I realized how much stress is just from driving everywhere in the U.S."
- Students from the 2023 cohort showed increased reflectiveness, used more comparison, and engaged in deeper structural analysis and systems thinking:
  - "Public transportation is part of daily life — it's not a backup plan or a last resort like it often feels in the U.S."
  - "You could live a full life without owning a car. That's freedom in a different way."
  - "The cities were actually built around people, not cars — you could feel it."
  - "It made me realize how isolating driving culture can be back home."
- Students from the 2024 cohort were highly analytical and value-driven, and they linked transportation infrastructure to environmental and social ethics:
  - "Transportation here isn't just about getting from point A to point B — it's about creating communities and protecting the environment."

- "The fact that Germany made it easy to live sustainably without even trying says a lot about what they value."
- "You realize that cars aren't just vehicles — they shape your whole environment, your health, even your social life."
- "Being able to take a bus, train, and bike seamlessly made me rethink what infrastructure should prioritize."

This seeming evolution in students' intercultural communication competence and critical and systems thinking tendencies led us to more deeply consider curriculum changes and our own evolution as faculty leads at home and abroad.

Taken together, these findings indicate that extreme short-term study abroad opportunities may have powerful impacts on engineering students, and may also produce measurable growth in intercultural competence, systems awareness, and professional identity development.

Future Directions
Future iterations of the engineering education abroad include more in-depth analysis of the students enrolled in our program with additional surveys and data collected. We plan to compare pre- and post-travel reflection analyses, as well as assess for influences of engineering major in student responses. Investigating whether students have previously traveled and identifying how many semesters students have completed at USF before participating in our education abroad program will also prove essential to understanding the true impact of short-term study abroad on students' development.

Additionally, we would like to follow-up with our students in subsequent years to explore downstream impacts of short-term education abroad. In particular, we would like to determine if our program inspired students to continue their travels to additional new destinations and whether it influenced their engineering career choices. Ultimately, we would also like to establish scholarship programs to increase the participation of economically disadvantaged students.

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Appendix A: Post-trip Reflection

1. Now that you have traveled to Germany, what is your impression of German culture?
2. How do you think your cultural background and biases (biases such as verbal and nonverbal communication styles, perceptions of individualism vs collectivism, perceptions of teamwork, etc.) impacted your interactions in Germany?
3. How did your experiences in Germany affect your understanding of what the term "sustainability" means?
4. How would you now compare/contrast sustainability efforts in the United States and Germany?
5. What was your biggest take-away from the trip? What were the most impactful experiences for you?
6. How did your experiences in Germany impact your perspectives?