The Future of Engineering Education
2024 Annual Conference & Exposition
Oregon Convention Center
Portland, OR . June 23 - 26, 2024
ASEE
Paper ID #42529

A Case Study: Organizing and Leading a 10-Day Field Trip to the UAE for Global Engineering Students

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Keywords: Global Engineering Education, Cross-Cultural Collaboration, Engineering Design Thinking, Global Context, UAE

Abstract:

Engineers have the ability and responsibility to design and develop solutions that can improve people's lives, solve pressing problems, and make the world a better place. Real-world challenges are becoming increasingly complex and global, and engineering projects often require collaboration between people from different cultures.

Global engineering is a general engineering course required by all engineering students. The course focuses on designing and developing engineering solutions to real-world problems in a global context. In spring 2024, the course was offered in an innovative way, with a lecture-based part and a hands-on laboratory part. The students designed and developed an innovative water and flooding detection system for a client in the UAE. The students worked during the spring semester in collaboration with engineering students from the UAE on developing the system using the engineering thinking approach. The students communicated with the students from the UAE virtually in bi-weekly meetings.

The author led a 10-day field trip with 24 engineering students to the UAE to build and test the designed product. This paper will present the preparation procedures, the design approach and methodology, and the feedback obtained by the students from this global engineering experience. The paper will also provide suggestions for designing and teaching such a course.

This paper will provide readers with the following: (A) detailed overview of the innovative global engineering course offered by the author academic institution. (B) description of the design process used by the students to develop a water and flooding detection system for a client in the UAE. (C) Insights into the benefits and challenges of collaborating with engineering students from another culture. (D) Recommendations for executing a global engineering course successfully. This paper will be of interest to engineering educators, researchers, and industry partners who are interested in learning about innovative ways to teach global engineering and to prepare students for the challenges of engineering in a globalized world.

I. Course Vision, Objectives, Structure, and Innovation:

Course Vision: Our Global Engineering course is deeply rooted in the vision and values of the School of Engineering at the University of Mount Union. The School of Engineering is committed to providing a holistic engineering education that prepares students for the challenges of a globalized world while fostering their leadership and communication skills. Our institution's vision for engineering education is encapsulated in our four pillars of engineering education, which are guided by the National Academy of Engineers' principles [3] and Mount Union's tradition as a liberal arts institution. These pillars are:

1. Providing Extensive Hands-On Real-World Engineering
2. Nurturing Global Engineering Competence
3. Integrating Engineering Knowledge with Essential Business Skills
4. Building Effective Leaders and Communicators

The second pillar, nurturing global engineering competence, is of particular relevance to our course and field experience. Through required international engineering field experiences like the one described in our manuscript, students gain firsthand exposure to diverse cultures, engineering practices, and global challenges. This experience is integral to their development as well-rounded engineers capable of addressing complex, real-world problems in an increasingly interconnected world. Our course has been designed to align closely with the goals of the School of Engineering, ensuring that students not only receive a rigorous technical education but also develop the cross-cultural competency and global perspective necessary to thrive in today's engineering landscape.

Course Objectives: The primary teaching objectives of the Global Engineering course revolved around equipping students with the essential knowledge and skills required to design and implement engineering solutions within a global context. The course focuses on imparting insights into the diverse cultures of the Middle East and North Africa, emphasizing the importance of cultural adaptation in engineering solutions. Students were engaged in understanding the functions and objectives of the Global Engineering Field Experience, with a specific focus on how engineering solutions could be tailored to diverse cultures and settings. The practical application of these concepts was demonstrated through a collaborative project where students designed, developed, built, and tested a novel Water and Flood Detection System in partnership with peers from Al Ain University in the United Arab Emirates.

The teaching objectives extend beyond technical skills to foster cultural awareness and sensitivity among students. Prior to our 10-day field trip to the UAE, instructors and invited speakers provided comprehensive insights into the diverse cultural identities within the United Arab Emirates (UAE). During the field experience, students engaged with local stakeholders, including the design and construction team of Zayed National Museum and the executive board of the Abu Dhabi Chamber of Commerce. This direct exposure allowed students to compare and contrast engineering processes with practicing UAE engineers. The collaboration with students from Al Ain University in building the "Water and Flood Detection System" further enriched their cross-cultural experience. After the field trip, the instructors actively encouraged students to reflect on their cultural biases and assumptions, fostering a deeper understanding. Additionally, interactive experiences during the field trip, such as the desert safari and visits to Al Ain Oasis, provided valuable opportunities for cross-cultural interaction.

Through collaboration with students from the UAE, our engineering students applied both the engineering design and construction of an innovative "Water and Flood Detection System" in the

UAE context. To enhance multicultural teamwork, student teams were strategically formed consisting of individuals from diverse cultural backgrounds. These teams, comprising both our global engineering class and students from Al Ain University in Abu Dhabi, were assigned projects requiring collaborative problem-solving to address real-world challenges. I actively provided feedback on students' teamwork skills, fostering their ability to effectively work in a global and diverse setting.
The teaching objectives of the global engineering course were extended to providing students with valuable experience in working with international clients. In this course we partnered with international organizations to create opportunities for students to design, build, and test their "Water and Flood Detection System" in a global context. Engaging in international design collaboration, our students gained exposure to the intricacies of working on projects with a diverse set of stakeholders. By fostering opportunities for travel and work abroad, the course aimed to provide students with a hands-on experience that goes beyond traditional classroom settings.

Course Structure: The revamped structure of the Global Engineering course (EGE 320) introduces an innovative format that combines a lecture-based segment with a practical, hands-on laboratory part. Commencing in the Spring of 2013 and continuing until the Spring of 2023, the course had been a cornerstone for every engineering student at the University, immersing them in community-centered engineering projects at international destinations [1]. The current four-credit hour course maintains essential components such as lectures, project work, and field experiences, yet the allocation of time has undergone significant changes. Lectures on international engineering topics, cultural and linguistic understanding sessions occur on Wednesdays, Tuesdays were dedicated to project work. Notably, the hands-on laboratory part, focusing on designing and developing engineering solutions for an international client, is scheduled for 50 minutes each Tuesday. These components collectively constitute three credit hours, with the final credit hour earned through the international field experience. The curriculum incorporates a blend of international business and cultural awareness lessons during the lectures, offering a theoretical foundation to equip students for navigating the global engineering landscape. Prerequisites for the class include the completion of the world languages requirement and the first-year engineering design course, ensuring that students enter the course with foundational knowledge in culture and the engineering design process. Two sections of the course and two sections of the laboratory component were offered in spring 2023. A total of 26 students enrolled in both sections I and II: 12 and 14, respectively. All students participated in the design and development process, however, only 24 students participated in the field trip to the UAE.

Course Innovation : In the 2022/2023 academic year, the first author undertook the responsibility of creating and instructing a novel hands-on laboratory component for two sections of the Global Engineering course, employing an inquiry-based learning approach. This student-centered methodology emphasizes learning through questioning, problem investigation, and solution discovery, fostering the development of crucial skills such as problem-solving, critical thinking, and teamwork. In their extensive report, Downey G.L. et al. identified four types of methods for attaining global competency: international enrollment, international project, international work placement, international field trip, and integrated class experience [4]. Our mandatory course for engineering students integrates essential elements from the international project, international field trip, and integrated class experience methods. As previously mentioned, the course integrates both theoretical instruction and practical, hands-on laboratory components. The theoretical segment

focuses on providing introductory education on various aspects of the UAE, including the Arabic language, customs, history, and government. This approach resembles an integrated class experience method. Additionally, a 10-day international field trip to the UAE was organized and successfully conducted. During this field trip, students had the opportunity to visit the Zayed National Museum, one of the largest construction sites in Abu Dhabi. They attended a presentation by the project manager and received a guided tour of the construction site. This firsthand experience provided students with valuable insights into engineering practices and workplace dynamics in the UAE, fostering a deeper understanding of multicultural engineering environments. This satisfies the main objective of an international field trip. Furthermore, over the course of a semester (Spring 2023), students collaborated on a design project to develop a solar-powered water and flooding detection system. This project, akin to a capstone project, required students from diverse engineering backgrounds to work together to address the needs of an international client. Importantly, the system was constructed and tested in the UAE, offering students a unique opportunity to apply their skills in a real-world context and gain exposure to global engineering challenges. This represent key aspects of an international project methodology. The success of the course project is attributed to the courses practical, hands-on laboratory part.

The laboratory experience was meticulously designed to commence with a real-world problem presented by our international client and partner, Al-Ain University in Abu Dhabi, United Arab Emirates (UAE). The identified issue involved water flooding major cities in the UAE during seasonal rains. In the lab, students were presented with this challenge, with the goal of providing an engineering solution. Following discussions, the students collectively opted to develop an innovative "Water and Flooding Detection System." To facilitate this, the students were divided into five multidisciplinary teams, ensuring diversity and minority representation in each team. Each team was assigned responsibility for designing and developing a specific component of the comprehensive system, addressing aspects such as load sensing, solar power, wireless communication, system structure, and monitoring station. Additionally, special attention was given to ensuring that each team included at least one international student from Al-Ain University, enhancing the collaborative and cross-cultural aspects of the learning experience.
In the "Hands-on Laboratory Work" segment of the paper, the team projects provided an invaluable opportunity for our students to apply their knowledge and skills to address a real-world problem, fostering the development of collaboration, communication, and presentation skills. While each team worked on its designated project, the challenge was to ensure seamless integration of components into a functional prototype. Multiple joint lab sessions were conducted throughout the semester, facilitating collaborative efforts in merging individual components into an integrated working system. This collaborative approach not only honed critical thinking and problem-solving skills but also enhanced communication and presentation abilities. To support their endeavors, the first author provided students with various resources, including articles, websites, and materials like cardboard. Given the time constraints of the spring semester and the impending field trip to the UAE during spring break, we had a mere 8 weeks to complete the design and development process. Initial ambiguity was addressed through scheduled office hour meetings in the first 3 weeks, clarifying the mission statement for each team. Continuous encouragement to collaborate and share ideas resulted in a clearer understanding by week 3. Providing constructive feedback further fueled project success. By early March, all components were seamlessly integrated into an innovative wireless and solar-powered Water and Flooding Detection System, poised for construction and testing in Abu Dhabi. The accomplishment of our students in this inquiry-based

learning experience underscores the effectiveness of developing essential engineering skills through practical, real-world applications.

The incorporation of the engineering design process into the global engineering labs was a pivotal aspect of the hands-on laboratory work. Guided by a systematic approach, students embarked on a journey that involved understanding the problem at hand, brainstorming diverse solutions, and developing multiple concepts. The iterative process of prototyping and testing solutions allowed for refinement until successful outcomes were achieved. Throughout this cyclical process, the first author provided guidance on each step, emphasizing the importance of flexibility, and revisiting earlier stages when necessary. Despite the challenge of fitting a substantial project into a limited timeframe of eight weeks, students successfully navigated the engineering design process. Their commitment is evident in various presentation modalities, including written reports, recorded video presentations, and detailed engineering drawings for each component. The integration of the engineering design process not only facilitated problem-solving skills but also encouraged effective communication of their findings and innovations.

The incorporation of remote collaboration tools played a pivotal role in fostering a global engineering community among our students and counterparts from Al-Ain University in Abu Dhabi, United Arab Emirates (UAE). These tools facilitated seamless communication, file-sharing, and real-time collaboration throughout the design and development of the "Wireless and solar-powered Water and Flooding Detection System." A total of 8 engineering students from Al-Ain University, along with 3 laboratory technicians, collaborated with my global engineering lab students in this innovative project. Bi-weekly virtual meetings, organized by the students themselves using Zoom™, provided a platform for discussion and collaboration. To allow the students to build relationships independently, I did not attend all virtual meetings, fostering a sense of camaraderie. Beyond Zoom™, students utilized email, WhatsApp, and social media platforms for communication. This virtual collaboration enriched the project by bringing diverse perspectives, enhancing virtual communication skills, fostering cultural awareness, and boosting problem-solving abilities. The virtual connections laid the foundation for effective teamwork during the subsequent in-person field trip to the UAE. The successful outcomes of the project, particularly in programming the system's microcontrollers and the infusion of innovative suggestions, were attributed to the collaborative and friendly spirit cultivated through these virtual interactions.

II. Project Overview:

A. Client need and an innovative water and flooding detection system designed by the students for a client in the UAE: In response to the escalating risk of flooding in desert regions, a critical need arises for an effective alarm system capable of promptly detecting water levels and potential flooding. This system must not only detect changes but also issue timely warnings to the residents in the affected areas. To address this necessity, a comprehensive system encompassing load sensors, a solar power system, wireless communication, a sensing station, and a monitoring station was designed and developed by our students for a client in the United Arab Emirates, Al-Ain University. The design outlines a comprehensive Water & Flooding Detection System tailored for desert regions. Incorporating load sensors, a solar power system, wireless communication, a sensing station, and a monitoring station, this system stands poised to deliver precise and timely warnings of water and flooding in desert environments.

B. Design approach and methodology employed by the students: The implementation of a well-defined and structured engineering design process was initiated by the first author, drawing upon a systematic approach outlined in the course textbook, "Product Design and Development" by Karl Ulrich [2]. This chosen design process was identified as superior due to its simplicity and clarity, making it highly effective in both teaching and learning settings. The product development process, as per the course framework, served as a guiding structure for transforming design ideas into functional and viable products. Student teams engaged in identifying needs, formulating engineering concepts, designing products, constructing alpha prototypes, and presenting their prototypes alongside compelling business cases. Emphasis was placed on applying principles of product reliability, robust design, and sustainability throughout the process. To provide students with a hands-on experience in design and development, the course incorporated experiential learning methods such as in-class activities, studio-like work sessions, critiquing of previous work, and engaging case discussions.

III. Field Trip Preparation:

Embarking on the Global Engineering (EGE 320) Laboratory journey filled me, the first author, with immense enthusiasm, particularly owing to its distinctive design integrating both laboratory and international field trip components. The focal point of this paper is the meticulous preparations and execution of the international field experience, providing students with a unique opportunity to engage in a multicultural team environment. The objective was to collaborate with an international client and design an innovative "Water and Flood Detection System," intended for testing in the United Arab Emirates (UAE). Scheduled during the spring break, from March 2nd to March 12th, 2023, this 10-day field trip involved the participation of 24 students, accompanied by 3 chaperones and the director of the School of Engineering. As the leader of this transformative international experience, I navigated the intricacies of organizing the trip and ensuring its success, marking it as one of the most significant and challenging endeavors. The upcoming sub-sections outlines the key pedagogical approaches employed to navigate and triumph in this remarkable adventure.

A. Procedures and Preparations: Within the comprehensive preparations for the 10-day field trip to the United Arab Emirates (UAE), the first author took a crucial step by crafting and submitting the Memorandum of Understanding (MoU) to the University's Center for Global Education. This pivotal document, accompanied by its supporting documents and petitions, played a fundamental role in orchestrating the faculty-led trip. The MoU meticulously delineated the trip's goals, objectives, logistics, and safety measures, providing a structured framework for the educational venture. Beyond serving as an informational guide, the MoU served as a linchpin for securing essential funding and approvals vital for the successful execution of the field trip.

B. Logistical Aspects: In anticipation of the forthcoming international field trip, a preparatory visit to the United Arab Emirates during the 2022 winter break was an essential undertaking. During this trip, key engagements were conducted, solidifying the groundwork for the transformative experience ahead. Meetings were orchestrated with Al-Ain University's administration and faculty, aligning project ideas and collaborative efforts for the Global Engineering course and field trip. Collaboration discussions were extended to Abu Dhabi Department of Culture and Tourism, fostering support, and resulting in a successfully secured

financial backing of approximately $12,800 (Figure 1). The department generously covered the hotel expenses for 24 students and 4 chaperones throughout the 10-day stay in a 4-star hotel. The funding for the hotel expenses was made possible through a personal connection of the author, who is currently serving as the Mechanical, Electrical, and Plumbing (MEP) Engineering Head at the construction site of the Zayed National Museum, a project managed by the Abu Dhabi Department of Culture and Tourism. Leveraging this connection, an email was sent to the head of the Partnerships Unit in the Abu Dhabi Conventions & Exhibition Bureau Department, expressing our interest in collaborating with the Abu Dhabi Department of Culture and Tourism for our global engineering experience in Abu Dhabi. Following a positive response, a series of meetings were arranged, including a detailed presentation of our course objectives during the preparatory visit. Subsequent virtual meetings were held to discuss logistics and the future vision for our collaboration, which includes the establishment of an annual "Abu Dhabi Global Engineering Summit." To secure financial support, the author submitted an application for funding through the "Advantage Abu Dhabi Application Form," [5] which was evaluated and approved by the Abu Dhabi Convention and Exhibition Bureau, a part of the Abu Dhabi Department of Culture and Tourism.

This preparatory trip also facilitated encounters with industry leaders, including the CEO & Head Dubai Campus & Director of S P Jain School of Global Management, the engineering team of Zayed National Museum, and the administration of Al-Ain Museum. These interactions paved the way for scheduled visits and meetings, offering our students an invaluable opportunity to delve into the realms of engineering, culture, and business in the UAE. This logistical groundwork laid during the preparation trip, encompassing site visits, schedule structuring, and forging key connections, was indispensable in ensuring the success of the international field trip and enhancing the overall learning and cultural experience for our students.

Figure 1: Global Engineering Preparation trip to Abu Dhabi Photos

Ensuring a seamless travel experience, the first author took on the responsibility of coordinating flights and ground transportation for our international field trip. This involved leveraging strong communication and negotiation skills, coupled with effective time management. The initial contact with the Abu Dhabi Department of Culture and Tourism proved fruitful, securing favorable flight rates through their connections. To expedite the booking process, the course instructors communicated with each student to confirm passport acquisition, addressing delays caused by some students obtaining their passports later than expected. Additionally, arranging ground transportation in Abu Dhabi involved negotiations with various companies for buses, taxis, and rental cars to secure the best possible rates. Despite the time-consuming nature of these tasks, the first author successfully managed to complete all arrangements, ensuring our students experienced a smooth and enjoyable trip.

Furthermore, students were organized into three travel groups, distinct from their project groups, assigning a dedicated chaperone to each group daily. Additionally, a student leader was designated within each group. This structure allowed students to interact with different chaperones daily, fostering diverse experiences. The student leaders served as key contact points, liaising between their respective teams, the first author, and the assigned chaperones to streamline communication and address any needs or requirements efficiently. This organizational model proved highly effective in keeping everyone well-informed and aligned with the tasks at hand.

Establishing effective communication channels, a WhatsApp group was formed for the entire group before departing Alliance, fostering seamless connectivity among participants. This platform served as a convenient means for sharing information, facilitating easy communication, and building excitement and anticipation for the upcoming trip. The WhatsApp group became a valuable tool for disseminating essential updates, addressing queries, and maintaining a sense of community among the participants throughout the journey, contributing to a more cohesive and informed travel experience.

C. Cultural Sensitivities: To enhance the cultural awareness and sensitivities of the hands-on laboratory experience, the first author integrated guest lectures by industry professionals into the Global Engineering Lab curriculum. This deliberate approach aimed to provide students with valuable insights into the contemporary global trends in engineering, technology, and innovation. One notable guest speaker, Mr. Scott Johnson, a distinguished alumnus from 1979 and Vice President for International Development at SolarCool Technologies LLC, was invited by the first author. Drawing upon his extensive global experience, including engagements in the United Arab Emirates (UAE), Mr. Johnson delivered two captivating talks. These sessions were designed not only to share technical knowledge but also to emphasize the cultural nuances, arts, and societal aspects unique to the UAE.

Aligning with the overarching objective of nurturing globally minded engineering talent, Mr. Johnson's narratives exposed students to diverse perspectives on global challenges and international business practices. Importantly, his focus on cultural elements provided students with a nuanced understanding of the societal context in which they would be immersed during the field trip. The interactive lectures served as a catalyst for fostering cultural awareness among the students, preparing them for a meaningful and respectful engagement with the host culture.

Furthermore, Mr. Johnson's insights inspired students to broaden their horizons, particularly resonating with those from minority groups or those with limited exposure to overseas experiences. The lectures not only contributed to the academic aspects of the course but also played a crucial role in motivating students to approach the forthcoming international field trip with curiosity and an open mind.

Beyond the classroom, these sessions facilitated the development of professional networks as students connected with Mr. Johnson. His generous provision of a sheet of travel recommendations served as a practical resource, offering valuable insights for students preparing for the extensive journey to Abu Dhabi. In essence, these guest lectures not only enriched the academic curriculum but also played a pivotal role in sensitizing students to the cultural intricacies that would characterize their upcoming experience in the UAE.

IV. Feedback and Experiences:

In the realm of academia, continuous improvement and pedagogical innovation play a pivotal role in shaping the educational experience. This section, "Feedback and Experiences," delves into the invaluable insights gained from student evaluations within the context of the 10-day field trip to the UAE for Global Engineering students. Faculty members in our institution undergo comprehensive evaluations by their students each academic semester, utilizing the faculty-approved "Student Evaluation of Instructor and Course" form. Students feedback is anonymous. Within the scope of this study, data from the Global Engineering laboratory course were extracted from these evaluations, administered electronically through a web-based form. The evaluation form comprised 20 questions, including 14 objective items answerable via checkboxes, and 6 open-ended questions designed to capture qualitative feedback. This section showcases excerpts from students' responses to the open-ended questions, shedding light on the effectiveness of the innovative pedagogical approaches implemented in the global engineering laboratory course taught by the first author and the leader of the field trip. Boxes contain examples of students comments from the instructor and course evaluation.

Feedback from students highlights the positive aspects of the Global Engineering Laboratory component (EGE 320 LAB 1 & 2) while pointing out areas for improvement.

A. Positive Feedback Obtained From Students: Feedback from students highlighted the transformative nature of the experience, with one student expressing the significance of exploring the UAE, collaborating with international peers, and gaining practical skills not covered in other courses.

"Exploring the UAE and working with the students from Al Ain were major in my learning experience. I learned a lot from this course while working on the project and learning how to physically do things I have yet to learn in other courses."

Student feedback emphasizes the course's strength in improving communication skills within groups and with peers in Abu Dhabi, highlighting the practical and interdisciplinary nature of the learning experience.

"As a civil engineer I learned about computer coding and how to deal more with electronics which I believe is a great skill to have."

"The strengths of this course were I learned how to communicate better with my groups as well with the students in Abu Dhabi"

The supportive comments from students emphasize the professor's, first author, commitment to both the project and cultural learning during the trip, highlighting the course's effectiveness in preparing students for real-world interactions and group work in a globalized professional landscape.

"Professor was set on having his students learn about the project as well as learning the cultural of the territory that was explored during the trip. Always encouraging students to push further and learn more."
"It was based on group work so in a sense it was good at preparing me for real world interactions while doing group work."

Students consistently praise the first author positive and engaging approach during lab sessions, fostering an environment conducive to active learning. The hands-on nature of the project allowed them to delve deep into topics such as transmitters, receivers, and Arduinos, gaining valuable insights into the integration of these systems for wireless data transmission. The instructor's positive attitude and guidance are highlighted as crucial elements in the learning experience, affirming the effectiveness of the hands-on laboratory work in expanding their knowledge and practical skills in engineering.

"Dr. XXX always had a positive attitude during Lab time and made sure everyone was actively learning."
"Over the course of this project I learned more about transmitters, receivers, ardunios, and how to incorporate these three systems to wirelessly transmit data."

Supportive comments from students in instructor and course evaluations further attest to the successful execution of this intensive project within the confines of a once-a-week lab structure.

"With only one lab a week we had a decent amount of homework but that is like any other lab and he was able to fit a huge project in only 8 weeks of class."

Students appreciate the separation of lecture and lab sessions, providing dedicated time for project work and cultural exploration.

"This is a good course and I like that the lecture and lab are separate so we have designated time to work on the project."
"I like that the lecture and lab are separate because it gives us time to focus on the project separately from the lecture stuff."

B. Challenges Stated in Students Feedback: Student feedback acknowledges the unique challenges of navigating cultural norms, highlighting the dynamic and enriching nature of the experience.

"The organization of the class could have been a bit better at times. During the trip we really never had much of an idea what was going on due to the itinerary constantly changing. This was not necessarily Dr. XXX's fault though, as we learned that changing plans last minute is culturally normal in the Middle East."

Suggestions for enhanced communication between the lecture and lab professors have surfaced as a valuable lesson from the initial implementation of this course structure. Acknowledging this learning experience and the importance of organizational improvements, future iterations will involve more effective communication strategies, building on gained knowledge and student expectations. Addressing concerns about course organization, particularly regarding project planning and last-minute decisions, prompts a commitment to restructure the syllabus and timeline. This adjustment aims to provide students with a more organized and well-planned course, minimizing last-minute changes. While some students perceived a decline in the lab course's value

post-field trip completion, it is crucial to emphasize that this phase serves essential purposes. Post-trip activities involve redesigning iterations, completing the engineering design process, fostering communication with international partners, and preparing comprehensive technical and cultural reports. As a response, a continued emphasis on the course's holistic educational objectives and the inclusion of valuable post-trip activities will be maintained, ensuring students benefit fully from the multifaceted aspects of engineering design, cultural immersion, and teamwork.

"There needs to be better communication between the lecture and lab professors."
"Have more communication with the lecture professor so that the lab can focus on the project and not having to teach us the culture that we should have learned in the lecture portion."
"The course could be improved by more organization. Try to meet with rising Juniors early so that the project and all the clerical type stuff can be taken care of ahead of time. Better organization and less last minute decisions would really help to improve this course."
"The lab course lost value after the trip since we were done with the project"
"Course should only be 8 weeks long if there is only one trip during spring break"

V. Conclusions, Lessons Learned, and Future Work:

Teaching the Global Engineering Laboratory component for the first time was a transformative experience that significantly enhanced the first author's teaching skills. The development of the laboratory content and structure allowed the refinement of the instructional approach, focusing on the Inquiry-based learning model. This model, centered around student-driven questions, investigating an unmet need for an international client, and innovative problem-solving within the engineering design and development process, enriched both instructional strategies and the students' learning experience. Furthermore, the experience elevated research skills, compelling the first author and the students to explore and comprehend remote collaboration tools, necessitating information gathering from diverse sources. The inclusion of guest speakers also contributed to this growth, as it involved reaching out to our professional network and building connections with experts across various engineering domains.

The process of designing and implementing the laboratory component not only honed individual skills but also fostered significant improvement of teamwork abilities. Collaboration with colleagues, administrators, and industry partners was essential in developing the lab curriculum, teaching plan, and organizing the field trip to the United Arab Emirates. Moreover, working closely with faculty, engineers, industry leaders, and students from the UAE through remote collaboration tools provided valuable insights into effective cross-cultural collaboration. The lessons learned from this experience will be pivotal in enhancing future iterations of the Global Engineering course, ensuring a more refined and impactful learning environment for students.

The meticulous planning undertaken by the first author and trip leader emerged as a cornerstone for the triumphant execution of the international field trip for the Global Engineering class. Diligent efforts were invested to ensure organizational precision and a well-defined plan, coupled with a commendable flexibility in navigating unforeseen challenges. Commencing with the creation of a comprehensive plan encompassing the itinerary, budget, and logistics, the author also implemented a communication strategy to keep all stakeholders abreast of the trip's progress. Notwithstanding unexpected hurdles, such as delayed passport acquisitions, the author adeptly adapted to these challenges, guaranteeing the trip's seamless progression. A notable source of pride lies in the establishment of meaningful relationships with key stakeholders in the United Arab Emirates, promising enduring benefits for Mount Union and its students in the future. Gratitude is

expressed for the opportunity to lead the international field trip, attributing the success, both professionally and academically, to meticulous planning, flexibility, and relationship-building skills.

Conducting the Global Engineering course field trip to the United Arab Emirates provided a platform for establishing valuable collaborations and partnerships, setting the stage for the forthcoming 2024 Global Engineering field trip. The connections forged with academic institutions, government agencies, and industry leaders in Abu Dhabi hold multifaceted benefits for faculty's professional development, the students, and the university:

• Academic institutions: Engagements with professors and administrators from Abu Dhabi universities facilitated insights into their engineering programs and laid the groundwork for potential collaborations. These connections may pave the way for student exchanges, collaborative research projects, and various opportunities for our students to engage with and learn from their international counterparts.

• Government agencies: Meetings with representatives from the Abu Dhabi Department of Culture and Tourism enhanced my understanding of the UAE's economic and cultural development plans. This knowledge will be instrumental in planning future Global Engineering field trips and designing courses and programs aligned with our students' needs. We believe that replicating this model of collaboration and seeking funding opportunities through strategic partnerships with relevant entities can indeed benefit other institutions and programs looking to organize similar study abroad experiences.

• Industry leaders: Interactions with CEOs and executives from companies in Abu Dhabi, including the Abu Dhabi Chamber of Commerce, provided invaluable insights into the challenges and opportunities within the UAE's engineering industry. This information serves as a foundation for preparing students for successful engineering careers and developing courses and programs tailored to meet the demands of employers in the UAE.

The established collaborations and gained insights from these interactions will significantly enhance the effectiveness of future iterations of the Global Engineering course and a aid in the development of a collaborative Global Engineering Symposium.

Acknowledgments:

The Global Engineering field trip was supported in part by Abu Dhabi Department of Culture and Tourism, Abu Dhabi, UAE. Loay Al-Zube thanks Prof. Ghanim Kashwani from Higher Colleges of Technology, Abu Dhabi, UAE, Mr. Moammer M. Al-Marzooqi and Eng. Khalid T. Alsaqqar from Abu Dhabi Department of Culture and Tourism, Abu Dhabi, UAE, Prof. Sahel Alouneh, Prof. Faten Kharbat, Prof. Qutaibah Althebyan, and Eng. Esraa Sami from AL Ain University of Science and Technology, Abu Dhabi, UAE, Mr. Scott Johnson from Sufishent LLC, Ohio, USA, Dr. Syed Qaiser Anis from Alliott Management Consulting, Abu Dhabi, UAE, and Prof. Christopher Abraham from S P Jain School of Global Management, Dubai, UAE, for their help and support for the field trip to Abu Dhabi.

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