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Expanding Access to Study Abroad: The Role of Virtual Exchange in Global Engineering Competency

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This is a student paper and will be presented by the student.

I. Abstract

Study abroad programs have traditionally offered students the opportunity to immerse themselves in new cultures, often for the first time. While the concept of traditional study abroad has been a cornerstone of international education for decades, recent innovations have expanded the ways students can access these opportunities. Programs like Collaborative Online International Learning (COIL) and the shift caused by the global COVID-19 pandemic further accelerated the potential of virtual exchange programs. While many U.S. universities have returned to in-person study abroad exchanges post-pandemic, virtual exchange has continued to thrive as a valuable complement for non-traditional students who face barriers for participation in traditional study abroad programs.

Virtual exchange programs offer students the ability to engage in intercultural learning without leaving their homes and opens doors for a more diverse range of students to develop global competencies and reap the benefits of studying abroad. These programs help address barriers to traditional study abroad, such as cost, distance, cultural differences, and the opportunity cost of missed income.

This paper starts with exploring the benefits of virtual exchange through the use of established assessment tools, such as the Cultural Intelligence Scale, Global Engineering Competency Scale, and Global Perspectives Inventory. We then introduce the VESA (Virtual Exchange and Study Abroad) kit, which is a portable resource that came out of the work of a faculty innovation group at our university. This kit enables faculty members to integrate virtual exchange into their study abroad programs. The goals of this kit are to appeal to faculty, be easy to check out from the university, be simple to use, and provide tools to foster a more inclusive and globally connected academic experience.

II. Introduction

Study abroad programs have served as a transformative opportunity for students to immerse themselves in different cultures, often for the first time. While these programs have been a cornerstone of international education, the landscape of study abroad has expanded to include virtual technologies. Innovations such as Collaborative Online International Learning, and other virtual opportunities initiated by the effects of the Coronavirus pandemic, have catalyzed the growth of virtual exchange programs [1]. Although many US universities have resumed in-person study abroad opportunities post-pandemic, there still exists a benefit to continuing virtual exchange programs.

Virtual exchange programs can offer an alternative for many students to broaden their access to intercultural learning. It allows students to engage with peers around the globe without having to leave their home institutions and can provide access to a more diverse range of students [2]. To

help understand the impact of virtual exchange on students, assessment tools will help to measure the development of intercultural skills and global awareness.

Additionally, this paper introduces the Virtual Exchange and Study Abroad (VESA) kit, a portable resource designed to help faculty seamlessly integrate virtual exchange into their existing study abroad programs. Its goals include appealing to faculty, being accessible to check out from the university, offering usability, and providing the necessary tools to foster an inclusive virtual exchange experience. By using the kit, faculty can enrich their traditional study abroad programs and extend the benefits to more students.

III. Study Abroad

"Study Abroad" is a chance for US-based university students to complete all or part of their studies in a university or institution outside of the United States. As the concept of study abroad has evolved, in part due to events such as the Coronavirus pandemic, the pedagogical practices implemented in study abroad has also changed, with many schools looking to integrate technology into their existing programs. The addition of these technologies is aimed at increasing the accessibility of study abroad opportunities to a wider range of students and to make it more attainable for faculty members to offer these programs. Technology, defined as "the application of scientific knowledge to the practical aims of human life, or, as it is sometimes phrased, to the change and manipulation of the human environment" [3], allows for the integration and development of existing knowledge for overall advancement.

There are many ways in which different technologies can be applied to study abroad programs. Whether these programs are long term (a semester or longer) or short term, students can benefit from the cultural and language exchanges facilitated. For example, a long-term program with a language exchange would benefit from language-based technologies, such as language learning apps, while short-term cultural exchanges could benefit from voice recorders or other self-reflection tools. The use of technology in traditional study abroad has paved the way for a more novel pedagogical approach: virtual exchange.

IV. Virtual Exchange

Virtual Exchange has been around since the internet started in the 1990s but has exponentially grown since the Coronavirus pandemic. Because virtual exchange is a multifaceted concept, many experts have developed definitions of what it entails:

- "An alternative form of student exchange that delivers the same benefits of traditional student mobility while utilizing more accessible tools at a much lower cost and in a safer way" [4]
- "A relatively low-cost online educational experience involving sustained interaction and communication between geographically separated participants using technology managed by trained facilitators" [5]

- "[Virtual exchange] entails the use of technology to bridge students across cultural and geographic boundaries from different contexts" [6]

Other definitions emphasize the importance of technology, the length of the exchange, and the roles professors have. Lastly, there is an emphasis on the fact that virtual exchange is inter-cultural and can be used to bring together students from two different cultures, languages, backgrounds, or geographical locations [7]. To obtain maximum success, virtual exchange programs need to focus on accessibility. Studies conducted have shown that these programs have a positive effect on student outcomes, for example, increased GPA, retention, and degree completion statistics.

A large emphasis on virtual exchange has been placed in the field of language learning, where platforms like Zoom or Skype make it more accessible for students to acquire the necessary skills. In these encounters, the students "compare and contrast each other's cultures while using the target language" [6]. Many colleges are attempting to integrate aspects of Virtual Exchange into their study abroad programs and curriculum. Since this is still a new, primarily post-pandemic technology, universities are undergoing these changes in different ways. Most of this integration, however, has been pioneered in the social sciences, and has had less of an impact on STEM programs. While this makes sense – one of the best ways to truly learn a language is immersion- there is much more that can be done with this technology. Aside from colleges, some high schools have also engaged in Virtual Exchange programs. For example, a high school in Phoenix implemented a virtual exchange system, using problem-based learning, in their biology classes. This entailed a very basic, high school level project, but it was able to combine aspects of both technologies [2].

With increased interest, however, also came criticisms. Critics of these programs are worried that they will take away interest from in-person study abroad programs. However, virtual exchange is not designed to compete with traditional study abroad but instead aims to be complimentary or preparatory to those programs or cater to students who would not be able to attend in-person programs [2]. In one of the articles, O'Dowd criticizes the term "Virtual Exchange", as he believes "that by using the term 'virtual', which carries the connotation of 'not being real', the activity may be somehow undervalued and that it merely serves to highlight the limitations of this activity compared to, for example, physical mobility programmes: 'The term "virtual exchanges" would suggest that online exchanges do have some limitations compared to real, physical exchanges'"[2].

There have been a variety of technologies that have evolved regarding virtual exchange and virtual study abroad programs. Most notably, these include COIL, MOOC, and IREX. COIL, or Collaborative Online International Learning, is a Virtual Exchange approach founded in 2004 at SUNY. The purpose of COIL is to bridge inter-cultural gaps and allow students and professors the chance to learn, discuss, and collaborate. In this method, professors design the experience while the students partake and learn from it. This allows students to have a different cultural experience, oftentimes without having to physically leave their home institution. COIL is now one of the most widely known and used global learning approaches. Through this program, students can get some of the benefits of study abroad (experience a different culture, language learning, international collaboration, broadening of horizons) without having to leave the United States [1]. Massive Open Online Courses, also known as MOOCs, are courses with unlimited online participation,

encouraging anyone with internet access to join. Lastly, the International Research and Exchanges Board (IREX) hold virtual exchange initiatives to connect students across different regions to work on projects depending on their interests. Programs like the aforementioned ones ensure that virtual exchange opportunities remain available to university students, regardless of their university initiatives.

a. United States' Programs

In the United States, study abroad programs are dependent on individual universities, and are not publicly funded. Universities can choose what they are willing to offer, and what universities abroad they partner with. In the 2021-2022 academic year, 188,753 students participated in a study abroad program [9]. Out of all students, more than two-thirds of students chose to study abroad in Europe, followed by Asia and Latin America. Over 83,000 students study in just five European countries: Spain, Italy, the United Kingdom, France, and Ireland [10].

b. Europe and the United States

Europe has developed a formidable study abroad program through the Erasmus+ coalition, which has allowed many European students to undergo intercultural experiences. There are many aspects that could be applied to the American higher education system, but there are also many key differences between the two entities.

There are many things that cannot be replicated when it comes to European study abroad. Most clearly, there is the distance factor. Most students who study abroad within the EU would be a maximum of 4 hours away from home (on a flight), with some low-cost airplane carrier options to get back home. Students from the United States, however, would be a minimum of 6 hours away from home, and travelling expenses could cost over thousands of dollars. Another major difference is the funding: since Erasmus is funded by the EU, the student has little to no extra costs when studying abroad. Hence, it is easier for families to consider the financial aspects of studying abroad. In the United States, the cost of education is typically borne by students, with some scholarship assistance occasionally available. Another main difference is general mobility and visas. Since Erasmus is within the European Union, and hence the Schengen Area, students do not need to obtain prior approvals or visas to study in a country different than their own. American students, however, must go through a lengthy (and sometimes expensive) process to be able to obtain a student permit to study in Europe.

Because of these barriers, and others (on-time graduation, for example) it is not always feasible for students to fit studying abroad into their course plan. However, it has been proven that studying abroad has many benefits, as seen in the intelligence scales. Virtual exchanges, in which students participate in international and inter-cultural collaborations, could be a way to overcome this gap in higher education. Although it is a fairly new concept (it started gaining momentum following the COVID 19 pandemic) there are universities that have been successful in their implementation of virtual exchange programs. There are various ways to implement virtual exchanges, whether they are integrated into existing study abroad programs or are implemented as standalone ones.

V. Scales

To successfully implement technologies in study abroad programs, a cohesive measurement must be used to quantify the success of the program. Scales such as the Cultural Intelligence Scale (CQS), Global Competence Scale (GECS), Global Perspectives Inventory (GPI), and Cultural Disposition Inventory (CDI) provide a foundation for evaluating the outcomes of these programs. Utilizing these tools ensures that the implementation of technology aligns with the program's goals and offers a standardized way to assess growth in areas such as cultural awareness, adaptability, and global competence.

a. Cultural Intelligence Scale

Cultural intelligence (CQ) is a relatively new concept that allows experts to measure intelligence using non-traditional metrics. This scale measures intelligence through the ability to be able to thrive in different cultural situations. CQ measures 20 items across 4 different types of intelligence: metacognitive, cognitive, motivational, and behavioral [11].

b. Global Engineering Competency Scale (GECS)

The Global Engineering Competency Scale measures the "skills and abilities needed for all graduates to live and work knowledgeably and comfortably in a transnational economy and global society" [12], especially as it applies to engineering students. This scale system considers a variety of different competencies that engineering students should have to succeed professionally.

c. Global Perspectives Inventory (GPI)

The Global Perspectives Inventory (GPI) is based on the duality of holistic human development: cultural development and intercultural communication. This survey is broken down into three further sub-scales within each theory: cognitive (knowing and knowledge), interpersonal (social responsibility and social interactions), and intrapersonal scales (identity and affect). [13].

d. Cultural Disposition Inventory (CDI)

The Cultural Disposition Inventory measures aspects of cultural awareness that must be developed over time, not just learned in academic or industry settings. Cultural disposition is divided into five subcategories: cultural appreciation, cultural openness/flexibility, global exploration, cultural equality, and global citizenship [14]. All of the aforementioned work towards recognizing, understanding, and working with those of different cultures and cultural experiences.

In one way or another, all of the aforementioned scales and assessments measure a participant's ability to adapt to and learn from other cultures. Since they are all self-assessed (the participants assess themselves), there could be some levels of error in the overall scores. However, these assessments would be very beneficial in a before/after scenario. It would be intriguing to see how these programs shape the outcomes, and more specifically if there is a major difference in outcomes between virtual exchange and study abroad. Overall, one thing that has been reiterated throughout all of the literature is the importance of cultural awareness, especially once college students graduate.

VI. Virtual Exchange and Study Abroad (VESA)

The VESA (Virtual Exchange and Study Abroad) team was formed to explore ways in which study abroad opportunities could be accessible to more students. The implementation of virtual exchange can come with many challenges, mainly the difficulties for faculty to implement such a novel pedagogical approach into their existing courses. VESA aims to ease this burden on faculty through the use of a portable kit, training modules, and pilot programs. This group began as a community of practice and then evolved into a Faculty Innovation Group (FIG) at Virginia Tech, which is a four-year, land-grant, public R1 university in USA. Virginia Tech believes in the importance of study abroad and virtual exchange and thus provides university resources to research the impacts of virtual exchange and different study abroad technologies. To become a Faculty Innovation Group, the VESA team had to apply for an initial pilot grant and then could consequently apply for 2 more grants as a three-year project. The work of the VESA team is evaluated every year, with reports due in December and May to determine whether they will continue receiving funding and resources.

Through a review of existing literature, study abroad programs, and gaps in current curriculums, VESA's goal is to implement ways in which students can get the study abroad "experience" without facing some of the cultural, economic, and social hardships that can come along with it. Through the comprehensive understanding of what similar universities are currently doing for their study abroad programs, VESA aims to enhance the traditional study abroad and virtual exchange experiences. During the Coronavirus pandemic, many universities adapted their existing study abroad models to fit a more hybrid or fully virtual approach. Although this may have been temporary for many universities, it provided some students – especially those who might not have had the chance to participate in traditional study abroad programs- the opportunity to engage in multicultural experiences within an academic setting. One of VESA's goals is to make this different approach more sustainable and attainable to undergraduate students.

a. First Year

During the initial year, VESA applied for a pilot program grant. This grant allowed VESA to look into opportunities to increase access and opportunities for global engagement for undergraduate students. The proposal addressed three barriers to studying abroad in many destinations: inconsistent digital infrastructure, language barriers, and students' financial and academic constraints. Throughout this initial year, VESA conducted research on existing pedagogies, trained faculty for pilot programs, led pilot programs in which they tested a variety of technologies, and debriefed results and identified future issues. This initial year was useful in identifying ways in which different technologies can be applied to study abroad experiences and allowed the pilot program team leaders to understand technologies that worked- and those that did not.

b. Second Year

In the second year, or Phase II of the VESA program, the group focused on tracking objectives, progress, and lessons learned to refine and expand future innovation groups and programs. The

team developed a couple of portable, travel ready toolkits, known as “VESA kits”. The kits were customizable, and could include items such as a portable charger, gimbal, phone, microphone, and international wall adapter, or a Lumix camera, SD card, charger, and adapters. Each kit was designed for faculty to be able to easily take this with them on their existing study abroad excursions. The VESA kits varied from trip to trip, with some including more sophisticated equipment, and four of these kits can be seen in Figures 1. The top left kit is designed for portability and cell phone compatibility, while the top right Go Pro kit is designed as an action-based camera kit, making it ideal for fast-paced activities. The bottom left Lumix camera kit is designed for interviews and capturing high-quality content, whereas the bottom right Insta360 camera kit is also designed for dynamic activities and 360-degree footage.

Figure 1: Four different VESA Kits

The VESA team also analyzed past pilot programs, and the implementation of the first iteration of VESA kits in South Africa, Ecuador, Italy, Germany, Australia, New Zealand, British Isles, and Switzerland. The aim was also to develop and launch a variety of communication deliverables, such as a VT News story, recruiting video, various social media posts and recruitment materials.

c. Third Year

For their third, and final phase, the VESA team plans to expand on the work they have already done by collecting data on how VESA technologies have assisted the pilot study abroad programs. According to the VESA proposal, the group is going to “prioritize the use of this technology to facilitate the establishment of lasting, ethical community relationships that will allow our students to contribute to community well-being year after year”, as per their third-year proposal. Due to the successful nature of the VESA group in the past, the team hopes this final phase will benefit students learning by expanding access to intercultural learning, supporting ethical service learning, allowing faculty to gather media for advertisement purposes, and providing a continuous support for engagement with different communities abroad.

d. Evaluation Methodology

In order to evaluate the effectiveness of VESA, there has been an effort to collect data from faculty members, which is critical in understanding user interface, feasibility, usability, and overall satisfaction of VESA on instructional practices.

The questions focus on gathering information from faculty members about their role in the study abroad program, their experience with VESA, and how it was integrated into their courses. Other topics include beneficial resources, positive aspects of the program, and areas for improvement. Additionally, the sample questions assess the effectiveness of the VESA kit overall, the faculty support provided, and the overall impact of the initiative on the study abroad program.

The interviews were semi-structured, meaning that while a set of predefined questions was used as a guide, the conversation evolved based on the professor's responses. Some questions were expanded, omitted, or adjusted depending on the direction of the discussion. The professor provided valuable insights into both their experience using the kit and potential areas for program improvement.

The pilot interview was conducted with a faculty member from the College of Science, who led a 10-day study abroad trip to the Galapagos. Having some previous experience in study abroad programs, the professor found the resources provided through VESA to be sufficient and had no existing expectations regarding the media kits. While the technology used was new, he found the kit's instructions and pre-departure training to be clear and effective, and helpful in the deployment of the VESA kit. He found the portability of the kit to be a major advantage and said that it offered higher quality content than a regular phone. The biggest tradeoff the professor identified was keeping the kit minimal while still having dedicated hardware- he acknowledged that more specific technology would have been beneficial for some activities, but that would have impacted the overall portability. Overall, the faculty members found the kit easy to use, the training provided was helpful, and the content produced was a valuable asset for recruitment initiatives and future courses. Based on his experience, the kit could be improved by offering optional add-ons for those who want more dedicated hardware while keeping the core setup lightweight and portable. Also, more hands-on predeparture training and a student assistant could make the kit easier to use and improve the quality of content.

e. Moving Forward

Currently, VESA continues to identify programs that could host aspects of virtual exchange. Through these pilot programs, different technologies can be implemented to determine which were helpful. VESA aims to make their "VESA kits" available for any faculty member who is leading a study abroad program – whether this be long or short term. They are currently looking at ways to implement a system to check out the kits with either University Libraries or the Global Education Office- which would make this program accessible to programs outside of the designated pilot programs. VESA is also working alongside Virginia Tech's communication department to create a series of Canvas training modules for faculty members going abroad. The goal of these modules would be for faculty members to understand the purpose of the VESA kits and be able to utilize all of the components to their full potential. The benefits of modules would include an

asynchronous approach, meaning that faculty could go through them at their own pace and decide whether or not to implement all aspects into their programs.

Alongside this process, VESA is currently developing a comprehensive scale to understand the effects of in-person and virtual study abroad on students. The hope is that these scales will be deployed to Virginia Tech's study abroad students prior to and following their programs. This next step would collect the necessary data for researchers to analyze the effectiveness of different pedagogical methods and technologies. The questions within the scale were carefully crafted to help us to understand the student experience and the different factors that can affect it. Moving forward, VESA hopes to optimize the study abroad experience and improve access by implementing virtual exchange into many existing programs.

VII. Conclusion

As study abroad programs have evolved, the need for innovative solutions has become ever-present. Virtual exchange programs, initially driven by the Coronavirus pandemic, have been proven to be a positive pedagogical practice for global engagement. Although these programs offer opportunities for more students to participate in global engagement, they also come with some unique challenges, such as technological disparities, faculty adaptiveness, and ensuring that students can have meaningful intercultural interactions.

The VESA team was created to understand ways in which to bridge the gap between traditional study abroad and virtual exchange, as well as to create a streamlined process for faculty members to be able to implement these practices into their existing programs. Through a phased implementation, VESA was able to identify and overcome barriers with solutions such as portable VESA kits, online training modules, and scalable pilot programs. This has allowed the team to enhance the accessibility of study abroad opportunities.

Through integrating virtual exchange into existing study abroad frameworks, VESA was able to equip faculty with the needed tools and technologies to succeed in a global environment. These efforts show that virtual exchange can complement traditional study abroad and should not be seen as a replacement. Overall, VESA's work was able to redefine how universities can create equitable and impactful study abroad opportunities for a larger percentage of students to be able to engage in intercultural experiences.

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