

Perspectives and Perceived Gains Among Undergraduate, Underrepresented Minorities in a Short Summer Research Abroad Program

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Perspectives and Perceived Gains Among Undergraduate, Underrepresented Minorities in an Evolving Summer Research Abroad Program

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Abstract

Ongoing research highlights a disparity in academic achievements and progression into graduate studies in Science, Technology, Engineering, and Mathematics (STEM) among historically underrepresented minorities (URMs). In response to this persistent trend, many studies have underscored the significance of research experiences and mentorship in facilitating the success of STEM students from underrepresented backgrounds. Notably, scholars have underscored the synergistic effect of combining study-abroad opportunities with research experiences, leading to reported improvements in self-perceived research skills, personal growth, and the development of valuable professional connections among underrepresented minorities.

The present study aims to provide program history, lessons learned, and future directions of a research abroad activity. Programs such as this are designed with the specific goal of enriching the undergraduate experience and bolstering the attainment of associate and bachelor's degrees, as well as facilitating progression into graduate studies in STEM fields for URMs. While the number of short-term research study abroad programs has been on the rise, there remains a dearth of research exploring students' perspectives and the resulting impact on student outcomes.

Since 2014, a cohort of 8-10 students per year were chosen to participate in the summer program. Following their selection, these students were coached into securing their laboratory placements abroad. Subsequently, they embarked on a comprehensive immersion into an eight-week summer research abroad program. At the end of the program, students had the opportunity to present their research findings at an annual University of Texas system regional conference and share their adventures while exploring their host institutions and countries. Also, the participants engaged in focus group discussions and completed a survey to provide feedback on their summer experience.

In general, the feedback from these activities indicated that participants were highly satisfied with their summer research experience abroad. Students said they would have benefited from more active support earlier in preparing for an international experience, including finding housing and researching important aspects of navigating their host country. Students reported they broadened their understanding of the opportunities available to them and gained more clarity regarding their career goals after college. These career pathways included graduate studies and several types of employment possibilities. Many students were able to network in their program and build meaningful connections that would support their future goals. Students reported overall satisfaction with their experience and felt that this experience broadened their understanding of the opportunities that are available to them. In the future, the program

leadership will establish relationships with foreign universities to streamline and reduce student burden when acquiring housing and a laboratory.

To enhance the overall experience, the program leadership will continue to provide ongoing coaching and weekly seminars to thoroughly prepare students for their research endeavors in new environments. Furthermore, the program is exploring opportunities to establish strategic partnerships with universities and institutions. This initiative aims to facilitate group deployments of students to specific research locations, fostering collaboration and providing enhanced support for the transitioning students during their time in the program. However, students will still pursue their own research agendas.

Introduction

With an increasing trend towards globalization in the STEM workforce, study abroad programs are important in helping the global economy by diversifying and building confident, culturally sensitive individuals who can understand socio-cultural nuances of different people. Higher education aspires to prepare students for their careers and life and to provide an equitable educational opportunity. For the first time in US history, we will become a majority-minority nation in less than two decades [1]. This population shift will change higher education. Given this, it is important that those involved in education abroad understand the advantages and barriers that underrepresented minority students face.

Benefits of study abroad STEM students

Study abroad programs offer numerous benefits for students in higher education, including those pursuing STEM disciplines. For STEM students, engaging in international experiences can lead to higher retention rates and shorter graduation times [2], [3], [4], and [5]. In addition, exposure to diverse learning environments contributes positively to academic success [2], [3], [4], and [5]. Specifically, study abroad programs foster integrative, deep learning environments which develop students' critical thinking [4]. The immersive nature of study abroad experiences provide students with opportunities to broaden their perspectives, develop intercultural skills, and gain a deeper understanding of their field within a global context. These indicators of educational effectiveness (retention rates, shorter graduation rates) are specifically powerful for underrepresented minority students as these groups have lower graduation and retention rates than their White counterparts [6].

Barriers to studying abroad for STEM Students

Despite these advantages, there are notable barriers that hinder STEM students from participating in study abroad programs. Highly structured degree plans in STEM fields can make it challenging for students to find suitable study abroad opportunities that align with their academic requirements [7]. Additionally, difficulties in transferring credits, a lack of STEM background among study abroad advisors, and financial barriers pose significant challenges. The multifaceted nature of these obstacles, often referred to as the Four F's (Faculty, finances, family, and fears), underscores the need for targeted initiatives to address these concerns and promote inclusivity in study abroad programs for STEM students [8].

Underrepresented minorities in study abroad programs

Overall, only 5.9% of higher education students participate in study abroad programs with most of those students being White and female (Institute of International Education, 2023). For example, 68.6% of all students who studied abroad identified as White [9]. Only 5.3% and 11.9% identified as Black and Hispanic, respectively [9].

STEM students from underrepresented minority groups may have compounding barriers. Studies have identified, fear of discrimination abroad, lack of family support or understanding of the benefits of studying abroad, lack of support from faculty and staff, and lack of discussions from faculty and staff about the benefits of studying abroad as the reasons why underrepresented minorities do not participate in study abroad programs [7].

Understanding the critical need to address the challenges faced by underrepresented minorities in STEM fields when engaging in study abroad programs, our initiative aims to bridge the gap and create a more inclusive landscape. By acknowledging the benefits and barriers outlined earlier, our program is strategically designed to empower STEM students from underrepresented backgrounds, offering a tailored approach that recognizes and mitigates specific challenges.

Program Timeline

Starting in 2008, a pilot program began introducing students to global research through international conference participation. Students who were interested in traveling abroad wrote a competitive essay describing their motivation for attendance. The essays were reviewed by a committee, and the selected student was told of their international travel award. During that phase, students, program staff, and faculty attended conferences in Budapest, Madrid, and Singapore. All students indicated a high level of satisfaction with their international travel experience. They also expressed a desire to participate in more international collaborations and activities, thus leading to the creation of a research program abroad.

The concept of the summer research abroad was to involve a small number of students (7-9 per year) in a full-fledged research experience at a university or research center abroad. The target group for this activity was students who had participated in a summer research program at one of the University of Texas System (UT) universities. These students would have previously completed a high-impact research project and be prepared for advanced laboratory work. These students would apply online, collect a letter of recommendation from their past research mentor, and if selected participate in a weekly online seminar led by the summer research abroad coordinator at UT Austin. The program would closely mirror the domestic UT summer research program in duration and last between 8-10 weeks, depending on the student's placement. The student would need to return to the States in time to present their research at an annual UT System research conference in early August.

Since its inception, summer research abroad has been popular among students and their faculty mentors. Many times, mentors would assist in the placement process by contacting international colleagues who could serve as lab hosts. The program had consistent participation until the

COVID-19 pandemic which effectively eliminated all international travel for 2 years. Because of the pandemic, no students travelled abroad in 2020 or 2021 and virtual research occurred for only two students in 2021. In 2022, the world re-opened, international travel resumed, and the selected group of students felt unprepared for the experience. The long-term impact of the COVID-19 pandemic is unknown. Thus, it is essential to identify the characteristics and factors that enable or hinder academic achievement. Previous studies e.g., [10], [11], and [12] created a questionnaire to assess students' self-efficacy, resilience, help-seeking/adaptation, academic structure, personal structure, and academic/professional concerns related to COVID-19 yielding positive results about students' perceptions of mentorship and support.

With coaching from their summer research abroad coordinator, they realized that no group had ever been more prepared due to their resilience during the pandemic and their increased ability to pivot in the face of unexpected challenges. They travelled that year with a high level of confidence and returned with some of the best research the Alliance had ever seen.

Renewed and expanding effort

The summer research abroad program remains highly popular, with nearly 40 student applications received from several different institutions for the 2024 cohort. Building on the overwhelmingly positive feedback from previous participants, the program is set to expand, accommodating the largest group of students during the summer of 2024 ($n=10$).

To enhance the overall experience, the summer research abroad coordinator will continue to provide ongoing coaching and weekly seminars to thoroughly prepare students for their research endeavors in new environments. Furthermore, the program is exploring opportunities to establish strategic partnerships with universities and institutions. This initiative aims to facilitate group deployments of students to specific research locations, fostering collaboration and providing enhanced support for the transitioning students during their time in the program. This will include the creation of communication channels with faculty mentors and institutional points of contact. However, students still can pursue their own research agendas. During their time abroad, the students will share their progress and document their cultural experiences in blogs that will be shared with the entire summer cohort of domestic research scholars. Summary videos, conference presentations and participation in future panels is also an expectation for participants once they return to the States.

Participants and Demographics

Since 2014, 62 students have travelled the globe to perform exceptional research in over 20 countries. Placements have included universities, research centers, and museums. These students have represented all Alliance campuses including several community colleges. Table 1 includes detailed information from 2014 to 2023. Students participated in an intensive research activity for eight weeks under the mentorship of faculty members for a minimum of 30 hours per week. In addition, students were required to create and present a poster for their project at the annual UT System Conference. At the end of their summer research experience, students were asked to participate in an online survey and focus groups to assess their perceptions of the research experience and mentorship. The evaluation team created the survey and focus group questions. Prior to data collection, permission was obtained from the Institutional Review Board.

Table 1. Program Information for SRA-Abroad (2014-present)			
Year	Partnering Institutions	Countries Visited	Number of students
2014	4-year institutions (5), 2-year institutions (2)	Germany, Italy, Switzerland, England	8
2015	4-year institutions (4), 2-year institutions (1)	France, Germany, Belgium, Switzerland, Taiwan	7
2016	4-year institutions (6)	Austria, Czech Republic, Ireland, Germany, Italy, the Netherlands	8
2017	4-year institutions (5), 2-year institutions (2)	Austria, Denmark, Germany, Spain, England	8
2018	4-year institutions (3), 2-year institutions (1)	England	4
2019	4-year institutions (3)	Canada, England, Germany, Italy, Japan, Switzerland	7
2020	4-year institutions (1)	Remote (England)	1
2021	4-year institutions (2)	Remote (Canada, England)	2
2022	4-year institutions (7), 2-year institutions (2)	France, Germany, Israel, Italy, Spain, Scotland	9
2023	4-year institutions (5), 2-year institutions (1)	Singapore, Panama, Costa Rica, England, Australia, France	8
Total students			62

Assessment

The surveys were administered electronically via Survey Monkey or QuestionPro during the final two weeks of the summer research experience and prior to the annual UT System conference. The students were notified and given several reminders to complete the survey. The participants were asked to provide basic demographic information (e.g., gender and ethnicity). Additional identifying demographic info included student classification (e.g., freshman, sophomore, junior, or senior), expected graduation year, academic major, and field of research. The next section of survey items included students' level of satisfaction with the summer research experiences, their mentor, their research project, and the instruction and preparation they received prior to attending. In addition, the participants were asked to report their

perceptions on the impact the summer research experience had on their research, academic, and professional skills. Each item was assessed using Likert-type scale items (1 = strongly disagree to 5 = strongly agree or 1 = not satisfied to 5 = very satisfied). A “not applicable” and a “prefer not to answer” choice was available for every Likert-type question. Finally, open-ended questions were included to assess the students’ motivation to apply and their suggestions and ideas for improving future summer research experiences. Table 2 includes demographic characteristics of the students and their level of satisfaction with the summer research experience.

Table 2: Demographic characteristics and satisfaction with the experience					
	2014	2015	2016	2017	2018
Gender	1 Female 5 Male	4 Female 3 Male	5 Female 3 Male	7 Female 1 Male	3 Female 1 Male
Satisfaction with experience	80% very satisfied or satisfied	100% either very satisfied or satisfied	87% very satisfied or satisfied	100% were very satisfied	100% were very satisfied
Hispanic	16.7 %	71.4 %	75 %	50.0 %	57.6 %
Minorities (Gender & Ethnicity)	66.7 %	100 %	87.5 %	100 %	84.8 %
	2019	2020*	2021	2022	2023
Gender	2 Female 5 Male		3 Female 1 Male	8 Female 1 Other	4 Female 3 Male
Satisfaction with experience	100% were very satisfied		75% were satisfied or very satisfied	85.7 % were satisfied or very satisfied	100% were satisfied or very satisfied
Hispanic	28.6 %		25 %	55.6 %	57.1 %
Minorities (Gender & Ethnicity)	85.7%		75 %	77.8 %	71.4 %
*Participants did not complete the survey.					

Focus groups were conducted with all students from the summer research experiences. The focus group questions were intended to understand the reasoning behind students’ responses to the survey data. For example, students were asked about their expectations of the summer research experience, the most helpful/least helpful guidance and instruction given, factors related to a successful summer research experience, skills gained from the experience, and student’s experience and relationship with their mentor.

Since 2014, there has been an evaluation of the program. Students participating in the summer research abroad program expressed a positive and enriching experience. They took pride in

learning about diverse cultures and languages. The program enhanced their confidence and research skills, providing valuable insights into applying classroom knowledge in a lab setting. This encompassed the practical application of skills (presentation skills, knowledge of software), the transformation of academic concepts into concrete research projects, and an enhanced understanding and confidence in navigating the research process. Some students aspired to work and live abroad, viewing their developed technical, linguistic, and social skills as valuable assets in their STEM career paths. Students reflected that their summer research experience helped them recognize the global scale and potential of scientific fields. They shared that they felt more motivated and closer to STEM, and that they were better able to visualize a career within STEM. Despite varying mentor engagement levels throughout the program, students appreciated the supportive role of the program coordinators.

Program coordinators actively facilitated preparatory efforts, engaging students over the Spring semester preceding their summer abroad. Through virtual meetings led by the program coordinator, students convened and shared insights with each other in preparation for their research experiences. The virtual format is necessary with students participating from across the state of Texas, and the preparator seminar allows students to not only meet with each other and share information but also to ask questions and discuss their progress with peers in a similar situation in their program. The coordinators compiled comprehensive resources and offered guidance on topics including budgeting, safety, and navigating culture shock. These were presented via lecture seminars, discussion sections, and meetings with former participants of the program to ask questions. In addition to the Spring seminar, students participating in the program communicated with coordinators about individual preparations and questions for their time abroad (finding a placement, purchasing a flight, securing housing, etc.) Attached is the 2024 syllabus for the program (See Appendix A). They also provided essential contacts for emergency situations and assistance with securing visas, which all contributed to a smoother travel experience. Students participating in the program are enrolled in the UT System overseas insurance plan, with coverage and inclusions discussed during the spring seminar, and non-UT System students are enrolled in the insurance plan through UT Austin. All student administrative pieces, including application, disbursement of funds, and coordination of the cohort were completed by a coordinator at UT Austin utilizing the resources available on that campus. During their experience, students learned that housing prices can often be negotiated through platforms such as Airbnb. Furthermore, it is advisable to communicate with the host laboratory to receive guidance on the most effective methods and areas for securing appropriate housing.

The goal of the spring seminar was to not only present resources and information, but to allow the students to come together and communicate as a cohort and to feel prepared for their time abroad before departure. The independent nature of the program and the student experiences demanded that students were comfortable both traveling abroad and doing so on their own; the coordinators' role was to prepare them for this experience by providing resources and guidance, but also by fostering confidence and independence.

Throughout the program students have mentioned a desire to have more information from previous cohorts, such as previous living arrangements and previous laboratory placements. Since this program relies on students to find and secure their research placement abroad, they felt this would make the process easier on students who are busy with a full class load and with other

preparation needed for the summer research abroad. Students have also mentioned having clearer guidelines or an agreement of the expectations for themselves and their mentors. This may assist students who would have liked more time to travel and experience the culture of their host countries without compromising their research schedule. This could also help students complete their research projects within the constraints of an 8-week timeline.

Some practical obstacles encountered included securing housing. Visa complications arose in various countries, with certain visa statuses causing disqualifications and difficulties in securing housing, emphasizing the importance of checking visa and housing conditions before applying. Students found navigating visa loopholes stressful and wished for clarity. It's essential to comprehend the visa processes specific to each country before the start of the program. Additionally, it is prudent to have additional savings to address unforeseen expenses, such as lost luggage, the necessity for a rental vehicle, or navigating transportation disruptions like metro strikes. Although these expenses were not anticipated, the students were able to secure financial assistance from program coordinators for certain costs. Furthermore, it is vital to ensure that the student's mobile phone service is compatible internationally or to arrange for a local phone service upon arrival in the host country.

Throughout their research endeavors, several students fostered a profound sense of belonging with their lab teams, making their summer research experience memorable. Being integrated into the lab culture, students formed bonds that extended beyond academic activities, partaking in social engagements such as dining at local eateries, attending music festivals, and experiencing cultural events together. Additionally, the independence granted to them in their research roles initially led to feelings of isolation but bolstered their confidence. This autonomy allowed them to take full ownership of their projects and cultivate a truly personalized research journey. Finally, throughout the history of the summer research abroad program there have been circumstance specific topics that have arisen. In 2016, a new topic was added to the focus groups discussions: terrorism. There were several terrorist incidents at home and abroad in 2015 and in 2016, during the months before the summer. For the most part, students accepted the risks involved with going overseas and paid close attention to the pre-program information. In 2020 and 2021, COVID-19 pushed the experience to be virtual. Students mentioned since they could not conduct laboratory experiments, they were asked to do literature reviews and design research experiments.

Conclusions

In conclusion, this program highlights the benefits of a STEM summer research abroad opportunity that targets underrepresented minorities. As mentioned before, underrepresented minorities students have identified, fear of discrimination abroad, lack of family support or understanding of the benefits of studying abroad, lack of support from faculty and staff, and lack of discussions from faculty and staff about the benefits of studying abroad as the reasons they do not participate in study abroad programs [7]. Additionally, STEM students in general have other disadvantages. For example, highly structured degree plans, low faculty support, financial barriers, and a lack of study abroad advisors with science backgrounds [7].

The program is entering a new funding phase, aiming to better support STEM underrepresented minorities. The summer research abroad program will provide ongoing coaching and seminars, preparing students for research in new environments. The coaching and seminars are meticulously designed to deliver the latest and most relevant information, ensuring participants receive cutting-edge insights vital for their research endeavors in a different country. Additionally, the program will search for strategic partnerships with universities for group deployments, fostering collaboration and support. Finally, the program wants to create a peer mentoring program, with students from previous cohorts guiding others before and during their experiences, enhancing overall support for transitioning students.

Moreover, the program will persist in integrating evaluation as a fundamental component. The program's evaluation has continually proven invaluable in guiding program enhancements. By systematically assessing various facets of the program, we gain valuable insights into its effectiveness and areas for improvement. This iterative process of evaluation has enabled us to make informed adjustments, ensuring the program remains responsive to the evolving needs of its students and maximizes its impact.

Throughout this program's history, underrepresented minority students selected to participate in this program come back from this experience highly satisfied with knowledge and skills to help them succeed in their STEM career path. Students found the program enriching, fostering pride in learning diverse cultures and languages. The experience boosted their confidence in applying and succeeding in STEM graduate programs, with some students reporting intentions of applying to STEM graduate programs abroad. This program prepares underrepresented minority students for the growing globalization in the STEM workforce. It builds confidence in research skills and nurtures culturally sensitive individuals capable of collaborating effectively with diverse teams. This program exemplifies a transformative approach to student engagement, offering valuable insights for those seeking to replicate its success. Through this paper, we aim to share perspectives on best practices, providing a roadmap for others interested in implementing similar initiatives.

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