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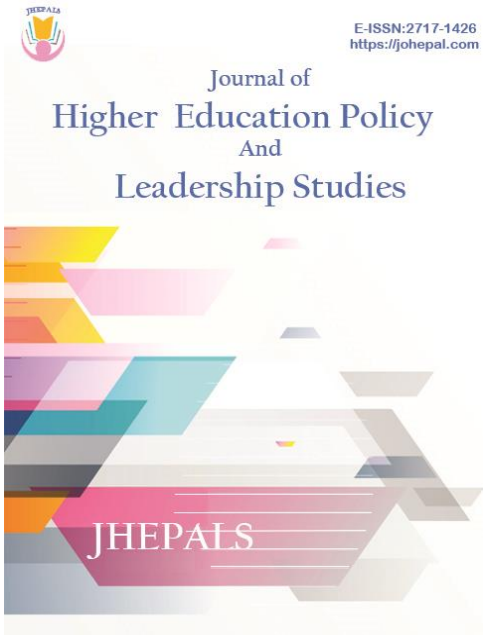


# A Qualitative Analysis of the Experiences of International Students in an Overseas Short-Term STEM Program

**Yunxi Qu**
*Ph.D. Graduate, University of Florida, USA*
Email: yunxi.qu@ufl.edu ; rivulet.qu@gmail.com

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# A Qualitative Analysis of the Experiences of International Students in an Overseas Short-Term STEM Program

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**Yunxi Qu** *

## Abstract

The increase in globalization over the last decade has introduced more competition across all industries, including higher education. Worldwide, colleges and universities are becoming more competitive, creating a need for schools to develop high-quality programming to attract students. To recruit and enroll more talented international students, many colleges and universities in the U.S. have developed short-term study abroad programs to introduce students to life in graduate school and market their graduate programs. This study aims to explore the experiences of international students enrolled in these short-term programs to determine students' perceptions and broader implications of these programs. To do so, I interviewed 15 international students who participated in an overseas short-term STEM program. Results highlight the importance of students' experiences related to sampling American education and culture, establishing faculty connections, communication-related challenges and opportunities, skill acquisition and development, and graduate school decision-making and admissions processes.

**Keywords:** Higher Education; International Students; Qualitative; Overseas Program; STEM

* **Corresponding author's email:** yunxi.qu@ufl.edu ; rivulet.qu@gmail.com

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## Introduction

Globalization is one of the most significant trends in the contemporary world. With the development of global telecommunications and modern transportation, more individuals are seeking to experience different cultures and study abroad in some capacity. Under current global economic trends, internationalization has become an increasingly important factor for universities and other education providers (Wit & Knight, 1999). International student enrollment has been considered a promising industry for the U.S. economy. As one example, having more international students is an effective strategy for dealing with the shortage of funding at universities, as international students are typically required to pay higher tuition rates than in-state domestic students (Hegarty, 2014). Based on the report from the Institute of International Education (2014), students from China make up the largest proportion of international students at U.S. universities.

Compared to the traditional long-term experience of studying abroad, with the goal of pursuing an entire degree in a foreign country, short-term programs tend to be more popular in recent decades due to their low cost and increased flexibility. With the increasing number of college students from all over the world who are coming to U.S. universities for short-term study, their experiences may have a long-term impact on their future (i.e., their graduate school choices and career plans). Although many colleges and universities in the U.S. have allowed and welcomed international students to participate in their short-term programs, few programs are specifically tailored to international students. Traditional short-term programs allow international students to register for certain summer courses and attend courses with current students; in contrast, customized short-term programs address the demands of students from unique sub-populations, thereby motivating more students to apply to these short-term programs. The purpose of providing these short-term programs is to help international students to acquire theoretical knowledge, develop hands-on skills, and gain personal experience of American culture, as well as to recruit more master's and Ph.D. students through the programs.

Short-term study abroad programs have become popular worldwide in higher education due to their low cost and flexibility. Through the programs, students gain experience in studying in a different culture and academic environment, and universities create opportunities to introduce their brands to students. Previous studies of short-term programs focus on students' motivation to participate in short-term programs, the learning outcomes of participants, and the impacts on students' career development. This study will contribute to the extant research by offering the following new perspectives.

First, the short-term programs considered in this study are in specific STEM areas, custom-designed for international students. While most current related research focuses on students' general experience of short-term programs, such as second-language learning and cultural experience, few studies explored the influence of STEM-related short-term programs on their skillset development and decision-making for graduate school selections. Participants of the STEM short-term program under this study all have strong backgrounds in science, which provides a good opportunity to examine the experience of students in STEM majors. This study has the opportunity to examine 1) what skills the participants acquired, 2) whether they developed the skills they desired, and 3) whether they gained

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unprecedented experience, not available in other programs, upon the completion of the programs.

Second, this study represents one of the first few research endeavors that consider the relationship between short-term programs and participating students' future graduate school choices. Because most participants of this program have a strong willingness to pursue a higher degree in another country in the future, it creates an opportunity to understand how their short-term study abroad experience at a university influences their willingness to enroll in the host university. Should this study show that students participating in short-term programs are more inclined to select the host university for their graduate study, this would support the current hypothesis that short-term programs should be emphasized by university administrators.

In a nutshell, this study will explore students' experiences in short-term programs and provide important insights for research and practice. Specifically, considering that short-term programs can be tailored for international students as a way for U.S. graduate schools to increase their enrollment, U.S. universities need to obtain deep insights into students' experience from existing short-term programs to design attractive programs in the future. This study provides solid evidence from students' perspectives and examines the role of an existing short-term program on students' future school choices. In addition, this study will explore the successes and pitfalls of short-term programs, identify lessons learned, and provide important insights on students' experience to aid future designs of high-quality short-term programs to benefit international participants.

This study seeks to provide deep insight into understanding international students' overall experience when participating in overseas short-term programs, and the impacts of short-term programs on students' future graduate study plans. The main research questions for this study are as follows:

RQ 1: How do international Engineering students perceive the value and benefits of the short-term program upon the completion of the program?

RQ 2: How does this program experience influence the international Engineering students' future graduate study plans?

## Literature Review

Students have shown an increased desire in recent decades to study abroad and learn different perspectives of the foreign world. Several factors contribute to the emergence and boom of short-term programs. First, the economies of the world have become more interdependent, and international travel has become more common, allowing students and faculty to study abroad for a short term (Anderson & Lawton, 2011). Second, students may be interested in short-term goals such as experiencing a foreign education rather than pursuing a long-term degree. Moreover, students or researchers who have already earned a degree from a domestic university want to further develop their research at a foreign institution.

Earlier work reported that short-term study abroad participation can have a significant impact on students in the areas of language skills and academic achievement through an immersive language-learning environment and a culture-specific pedagogy on academic disciplines (Brecht, 1995; Dwyer, 2004; Freed, 1995). Cubillos (2009) conducted a

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comparative study to investigate the impact of a five-week intermediate Spanish course on the skill of listening comprehension. The treatment group included 48 participants in short-term study-abroad programs, whereas the control group included 92 peers enrolled in a similar course at the home campus. The researchers noted that students in the treatment group had significantly higher comprehension gains and achieved higher levels of confidence and self-perceived ability after their experience of studying abroad.

### Academic Progress Due to Study Abroad Experiences

The academic component of a study-abroad program has a significant impact on the amount of knowledge and the proficiency of the skills acquired by the students during the period of the program (Tajes & Ortiz, 2010). According to Llanes and Muñoz (2009), most studies mentioned second language improvement or positive attitude changes for students that spent multiple weeks abroad. Dwyer (2004) examined the outcomes of study-abroad participants from 1950 to 1999, in particular, the long-term impact on their academic, professional, and personal development. In the study conducted in 2004, Dwyer surveyed all alumni from the International Education of Students (IES) study-abroad programs from 1950 to 1999. More than 3,400 alumni replied, which represents a response rate of 23%. Dwyer found that the long-term impact of academic commitments was significant at 84 percent; the academic commitments include increased interest in academic study, pursuing advanced degrees including master's and doctorate degrees, and stronger motivation to study foreign languages.

Schubert Jr and Jacobitz (2013) investigated the outcomes of Compact International Experience (CIE) courses. These courses served two purposes: one is to meet strong student demand for international engineering studies; the other is to satisfy the need of the home institution for internationalizing the curriculum. The efficacy of such courses was measured through two three-week engineering elective courses offered in France and Australia. Specifically, the two courses were "Topics in Fluid Mechanics" and "Advanced Electronic Circuit Design". The assessment demonstrated that substantial engineering technical content was successfully conveyed to the students, and at the same time, the students enjoyed an enriching international experience.

Ruth et al. (2019) studied the long-term benefits of short-term research-integrated study-abroad programs. They observed that study abroad and research experiences were rarely combined at scale, albeit they were proven effective pedagogical tools. Ruth et al. (2019) integrated research into short-term study-abroad programs in multiple countries, then examined students' perceived impacts. Positive self-reported impacts on academic and career success (e.g., professional connections, specific skills, worldview, and personal growth) were observed after analyzing data provided by 118 former participants. It was concluded that the inclusion of research components in short-term study abroad can provide additional value to students (Ruth et al., 2019). The benefits were more pronounced for female and minority students who usually have fewer on-campus opportunities for science, technology, engineering, and mathematics (STEM)-field research supervision.

McLaughlin et al. (2018) studied the impact of a short-term study abroad program that integrates undergraduate research with courses. They noticed that little empirical research exists on students' learning outcomes following their participation in a short-term program with an integration of research and courses. To address this, McLaughlin et al. (2018)

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designed an international program in Costa Rica and Panama which allowed students to engage in research areas in ecology and conservation biology. Based on the assessment of fifty-four students, it was observed that participants improved their scientific skills and knowledge domains in both the fields of ecology and conservation biology. Coker et al. (2018) conducted a five-year study of 1,858 graduating seniors at Elon University and measured short-term study abroad programs' outcomes. Their study showed that short-term programs are valuable for the academic growth of participants.

## Career Development and Graduate School Selection

Llanes and Muñoz (2009) found that studying abroad made students more competitive in the professional world. Dwyer (2004) observed that the long-term impact of a short-term program on career development was acknowledged by 69 percent of the students surveyed. Chang (2012) investigated undergraduate students' perceptions of studying abroad and their readiness. The study was also intended to determine how they choose graduate schools if they pursue graduate degrees. It was found that gender and major affect students' perceptions of the importance of studying abroad and their readiness to study abroad. Hunter et al. (2019) studied the benefits of a short-term engineering study abroad program over fifteen years. Since 2004, Brigham Young University has offered a graduate study abroad course in mechanical engineering to help prepare students to be leaders in globally influenced product development organizations, especially multinational corporations or transnational corporations. The purpose of the study by Hunter et al. (2019) was to examine the benefits of a short-term, study abroad program for engineering students. The survey data showed a positive perception of global product development and career development by the former participants.

Ebenstein et al. (2017) investigated three-week study abroad engineering programs over twelve years from May 2004 to May 2016. The goal of the short-term program is to better prepare the students for their future careers and stay competitive in a global context. Both the direct assessment by faculty and the self-assessment by students indicate that the short-term program achieved a high level of outcome for students' career development. O'Connell and Ayllon (2016) studied student perceptions of a five-week study abroad program. The objective of the short-term study abroad program is to help the participants develop global competency skills. The results showed that the study abroad program is conducive to the increase of student awareness and development of global engineering knowledge and skills, which enable them to survive in an ever-changing technical world. Gordon (2022) conducted a three-year review of a short-term study abroad engineering program, specifically, Contemporary Projects in Aerospace Engineering Manufacturing (CPAEM). CPAEM is an elective course with a short-term study abroad component. From the outcome survey data, it was observed that the study abroad element is effective, and students gained a good appreciation of the global perspective of engineering and products; in addition, it helped students achieve their professional goals.

## Potentially Negative Effects of Short-Term Program

If a short-term program is not carefully designed, it may disrupt course sequencing, interrupt internships, or lose focus by not addressing the technical subject matter (Gordon, 2022). This is more pronounced for STEM areas in particular. Matching students' interests with the

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technical content and teaching materials of a short-term program and adapting the pedagogical materials of the program are instrumental in the success of the short-term program.

Kamdar and Lewis (2015) found that although students typically report study-abroad participation to be positive, some survey data suggests that study-abroad programs may not always help participants make significant academic progress due to limited supervision by faculty or other attractions such as tour visits and entertainment. The problem can be caused by the fact that assessment of the outcomes of the short-term programs is often incomplete or relies fully on self-reports from student participants. While there is a wealth of research about individual student-level outcomes, there is little research about the effects of short-term study abroad programs on students' future graduate study choices.

## Research Methodology

This study leverages interviews with 15 Chinese international students who participated in an overseas short-term STEM program to explore and better understand the experiences of these students within their particular contexts. To do so, I have chosen phenomenology as the inquiry approach. Taking an epistemological stance of constructivism, I believe that individuals extract unique, subjective meanings from their experiences. I will utilize the inquiry of phenomenology to "engage with phenomena in our world and make sense of them directly and immediately" (Crotty, 1998, p. 79). The approach of phenomenology allows me to understand the essence of students' shared experience and is used to describe the lived phenomenon of students participating in short-term oversea programs. Phenomenology is both a methodological approach to qualitative inquiry and a theoretical framework (Bhattacharya, 2017). Thus, it not only offers methodological guidelines for me to implement in designing my study but also provides me a theoretical lens for understanding what brings Chinese students to short-term overseas programs, their program experiences, and the effects of program participation on them.

As a method of inquiry, phenomenology is a "way of thinking about knowledge" (Qutoshi, 2018). It not only requires scholars to describe the natural living experience of participants from the level of understanding but also encourages them to interpret a living experience through reflection and intellectual engagement (Qutoshi, 2018). With the inquiry of phenomenology, scholars think about the experience "at a conscious level", and gain insights into the experience through bracketing (Qutoshi, 2018). At its core, phenomenology is an approach to understanding the human experience as it is based on the knowledge of the researcher. So, it is important to maintain the subjectivity of the phenomenon (Qutoshi, 2018) as well as address the issue of personal bias while engaging in reflection. To that end, in reporting the results, I have summarized the experiences of the students and generated the themes based on interview data.

### Institutional Setting

This study is based on a short-term research program offered by an engineering department at a Southeastern Research University (SRU), including short-term workshops and research internship programs tailored specifically for international students. While the programs are open to all international students, they are specifically marketed to Chinese students. Only

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Chinese students have attended the programs. The workshop program provides students with lectures and hands-on experience in the fields of electrical and computer engineering. Two different topics are offered: deep learning and robotics. The research program lasts for seven weeks and encourages the students to complete a project under the supervision of a faculty member and a teaching assistant. Since 2020, the programs have been offered online in response to the public health risks posed by COVID-19. During the past four years, over 200 Chinese students majoring in STEM fields have participated in the short-term workshop and research program.

The program was designed to include a mixture of classroom time, hands-on lab experiences, and social outings. The participants were enrolled in either the three- or seven-week program. All programs consisted of daily lectures and culminated with a team project. Classes were supported by graduate student teaching assistants, who provided guidance on course content and projects.

## Participant Selection

Sampling is a key component when conducting qualitative research (Mason, 2017; Robinson, 2014). To explore the experiences of Chinese STEM students in short-term overseas programs, students who participate in the short-term workshop program and short-term research programs are considered the proper interviewees to answer the research questions. Participant selection combined purposeful and snowball sampling (Mason, 2017).

Purposeful sampling can make sure that the participants meet three predetermined criteria: (a) the student is currently participating or has participated in a short-term workshop or research program offered by the engineering department at SRU (i.e. that they have experienced the phenomena under study); (b) the student has been enrolled in Chinese higher education institution as a full-time undergraduate student while participating in the short-term workshop or research program; (c) the student majors in STEM fields. Considering the gender imbalance in STEM majors (Nimmesgern, 2016; Beede et al., 2011), I used the method of stratified sampling to ensure female STEM students were included. Snowball sampling was used to recruit participants for this study by asking key individuals with knowledge about potential participants who fit the study's parameters to identify these prospective subjects (Babbie, 1995). I asked administrators of the short-term programs in partner with Chinese universities to help me recruit participants by posting advertisements and sending recruiting emails to the targeted students. I then asked participants identified in this step to refer new participants to the study.

## Data Collection

Semi-structured individual interviews were used to collect the data. Fifteen students from six different Chinese universities were interviewed (see Table 1 for a breakdown of participant information). Under the circumstances of COVID-19 and the fact that the interviewees were located in different places globally, I conducted virtual interviews and asked permission from the interviewees to record the interviews for future analysis. I chose interviews as the primary method of collecting data because through communicating with the interviewees, I was able to explain the interview questions to students and make sure they fully understood my research questions and interview questions.

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Table 1.
Participant Information

| Participant Name* | Gender | Program Topic | Year of Participation | Program Format | Length of program | Enrolled at SRU? |
|---|---|---|---|---|---|---|
| Fang | Male | Deep Learning | 2019 | In-person | 3 weeks | Yes |
| Jing | Male | Robotics | 2019 | In-person | 3 weeks | Yes |
| Li | Male | Deep Learning | 2019 | In-person | 3 weeks | No |
| Fen | Female | Deep Learning | 2018 | In-person | 3 weeks | No |
| Tao | Male | Deep Learning | 2019 | In-person | 3 weeks | Yes |
| Wei | Male | Deep Learning | 2019 | In-person | 3 weeks | No |
| Mei | Female | Summer online research | 2020 | Virtual | 7 weeks | No |
| Bao | | Deep learning | 2018 | In-person | 3 weeks | No |
| Yan | Male | Deep Learning | 2019 | In-person | 3 weeks | No |
| Shu | Male | Deep Learning | 2019 | In-person | 3 weeks | No |
| Qiang | Male | Deep Learning | 2019 | In-person | 3 weeks | No |
| Zixin | Male | Deep Learning | 2019 | In-person | 3 weeks | No |
| Donghai | Male | Deep Learning | 2019 | In-person | 3 weeks | Yes |
| Ming | Male | Deep Learning | 2020 | In-person | 3 weeks | No |
| Liling | Female | Deep Learning | 2019 | In-person | 3 weeks | No |

* To maintain anonymity, participant names have been changed.

Interviews also allowed me to ask follow-up questions when necessary to get more detailed and valuable thoughts from the students. The semi-structured interview method was selected to enable me to both get answers to my research questions and leave some flexibility for participants to share any lived experiences that did not fit into my protocol to fully understand the phenomena.

I followed the framework suggested by Kallio et al. (2016) to conduct the semi-structured interview. The first step is to evaluate whether it is appropriate to use a semi-structured interview as the rigorous method to collect the data. This research is intended to understand the benefits of participating in short-term overseas programs by analyzing the experience and opinion of international students who participated in the programs; hence, semi-structured interview is suitable and serves the needs of the research well (Barriball & White, 1994). Åstedt-Kurki and Heikkinen (1994) also pointed out that the semi-structured interview is a suitable tool when participants are less likely to talk about their intentions and ideas about certain issues. I anticipated that students may not have been used to discussing their experiences of attending short-term study abroad programs and may have needed a protocol to guide their thoughts and discussion.

The second step is to review the literature and obtain a comprehensive understanding of knowledge on the research topic. As expressed by Rabionet (2011), it is important for the researcher to have in-depth knowledge about the content. Comprehensively reviewing previous literature helped me focus on the research topic and ask the right questions about the phenomena. Subsequently, to ensure the interview questions that I prepared effectively addressed the research questions, I asked the opinion of experts in the field of qualitative research about the language, wording, and relevance of the interview questions. There were some modifications to the interview questions upon the completion of this review process.

The third step is to formulate the preliminary semi-structured interview guide. The guide is a list of interview questions and leads the conversation to the research topics in the

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interview process (Whiting, 2008; Krauss et al. 2009). For this purpose, I drafted the interview protocol in advance. I followed the protocol to ask research questions and guide the direction of the interview, allowing for deviation when students' responses did not fit neatly into the protocol. The interview protocol (see Appendix A) contains open-ended questions about students' motivation, engagement, interactions, and feelings. This interview protocol was used as a general guideline to encourage students to express their ideas and allowed me to obtain information to answer the research questions. However, the interview protocol did not limit the content of the discussion; especially when the participants expressed some valuable ideas that were not reflected in the protocol questions, I encouraged the participants to further discuss them. Moreover, I asked follow-up questions as necessary to make sure that the interviewee understood my questions accurately and easily so that I could get the most useful information from them.

The fourth step is to conduct a pilot test. Many previous studies suggested a pilot study as an effective way to identify the flaws or limitations of the interview questions and allow for modifications for the main study (Kvale, 2008). Chenail (2011) also suggested pilot study as an effective way to improve the quality of data collection. Through conducting a pilot study, research integrity, research ethics and research ability would be tested (Chenail, 2011). Kallio et al. (2016) suggested three ways to conduct a pilot test, namely, "internal testing", "expert assessment" and "field-testing". "Internal testing" usually means a process of inviting collaborators in the project to review the interview protocol and provide advice and comments on vague expression, inappropriate leading questions, and personal bias the researcher may have (Chenail, 2021). However, since I do not have any collaborators in conducting the project, I consulted peers to review my interview questions and provide suggestions. I also viewed the questions through the lens of an interviewee to determine how I would answer the interview questions (Chenail, 2021).

## Individual Interviews

Creswell and Poth (2016) identified the advantage of using the semi-structured interview since it allows the interviewees to express their thoughts and experiences freely as they desire. The expression is not constrained by any expected outcomes from researchers or previous theories. According to Fern (1982), in-depth individual interviews encourage the participants to generate more ideas. The individual interview provided the interviewees a more comfortable and safer environment to express their ideas and experiences. For this study, the duration of each individual interview was about forty-five minutes, though some participants were more reserved, resulting in shorter conversations.

## Data Analysis

I used the Zoom videoconferencing tool as the platform to conduct the interviews. After completing the interviews and storing the recorded video, I first used Zoom software to help me generate the transcript. After obtaining the initial transcript generated by the Zoom software, I carefully listened to the voice recording sentence by sentence to make sure the transcript was accurate. In addition, I paid close attention to the transition between sentences.

After translating the interview speech into a transcript text in English, I followed the recommendation of Creswell and Poth (2016) to conduct data analysis. I first created a file

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and organized all my transcripts in the file. Then I read through all the transcripts to obtain a general sense of the data, made margin notes while reading, and formed an initial idea about how to code the data. Finally, I read through the transcript sentence by sentence to code and identify the common themes (See Appendix C).

To conduct thematic analysis, I used several techniques recommended by Ryan and Bernard (2003) to identify themes. The first technique I used was the word repetition. I identified the repeated words and figured out whether the words suggested any themes. The second technique that I employed is the cultural insider categories. As a Chinese international student who shares a similar culture with the participants, I was able to identify the expressions that only the cultural insider would understand. The next method that I used to identify the themes was similarities and differences. With this concept in mind, I compared the expression of different interviewees and came up with themes by identifying the similarities and differences. Finally, I connected the expression of the interviewees to the existing theories to identify the themes. In the process of generating themes, I organized supporting evidence of the words and expressions to form identified themes through careful analysis of the transcript data.

## Trustworthiness

Trustworthiness is an important consideration in qualitative research. Previous scholars have different perspectives on ensuring goodness and trustworthiness (LeCompte & Goetz, 1982; Lincoln & Guba, 1985; Lincoln, Lynham, & Guba 2011; Lather, 1993; Richardson & St. Pierre, 2005). I followed the strategies proposed by Creswell and Poth (2016) to improve the validity of my research. Creswell and Poth (2016) suggested consistent engagement and observation as an approach to build trust with the participants, understand the culture, and confirm the accuracy of the information to increase the degree of validity.

In the phase of generating transcripts, I used several approaches as described in the previous section to ensure the accuracy of the translation if interviewees are willing to participate in the interview using their native language. In triangulation, I used interviews to generate the themes. In addition, I invited a peer debriefer to check my themes and ask me questions before finalizing the themes into findings. I entered the analysis phase understanding that not all content in the transcript would fit the themes. I also asked the interviewees to check my codes, analysis, and findings to make sure I properly interpreted their ideas to increase the credibility of the research (Ely et al., 1991). I was the only person to code the data which ensured the consistency of the coding process and increased reliability. I received permission from the participants to allow recording of our interviews through Zoom. The recording enabled me to review the interview whenever I needed to and as many times as I desired to enhance the reliability of the study.

## Researcher Subjectivity Statement

The researcher of this study is a former Chinese international student who recently earned a Ph.D. in higher education administration and policy. First, as an international student, I have experience studying abroad in the U.S. The background enabled me to better understand the experience of the interviewees and ask reasonable follow-up questions. Furthermore, being Chinese, I share the same culture as the students, which aided me in better understanding the pragmatic information behind the expression, pause, changing

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tones, and voice. Nevertheless, I may have my personal biases and preconceptions. My thoughts on what study abroad programs should be like for Chinese students and how they would influence the Chinese students like me could color my interpretation of the data. I was very cautious in the process of leading the interview and interpreting the thoughts of the students to avoid incorporating my personal bias in the process of data collection and data analysis.

In addition, I have been involved in the short-term programs at SRU for several years as a volunteer assistant. The experience puts me in both an insider and an outsider position. On one hand, being an insider provides the foundation for building up trust between me and the interviewees, which could benefit the interviewing process and provide the participants with a relaxed environment to express their thoughts. On the other hand, the relationship could also lead to a situation that a participant hesitates to express negative opinions about their experience due to the knowledge of my volunteer position in the program, which will influence the reliability of the research.

## Results

In the results section, I outline emergent themes related to international students' experiences regarding their participation in an overseas short-term STEM program. Ultimately, the aim was to better understand the perceptions, lived experiences, and graduate school decision-making of overseas short-term STEM program participants. The key themes include experiences related to sampling American education and culture, establishing faculty connections, communication-related challenges and opportunities, skill acquisition and development, and graduate school decision-making and admissions processes.

### Sampling American Education and Culture

Many of those interviewed indicated that they had already decided to pursue an advanced degree in the U.S. before attending the workshop. Consequently, experiencing the American academic and social culture was a chief priority. Several participants expressed that their taste of American culture was a highlight of their time at SRU for the short-term program. Wei explains that the program has built several cultural and social experiences for participants. The evenings gave the participants time to experience the lifestyle of American college students. Interviewees shared that they visited nearby attractions and tried different local restaurants recommended by the teaching assistants. They could also engage in fun activities and social events on campus. A particularly memorable day for Fang was when they went tubing down a river at a state park.

Participants also got a preview of American academic life. Their program involved daily lectures and a team project that required outside research and collaboration. Many interviewees found this to be much different than Chinese academic culture. As Wei explained, many professors in China are just concerned with finishing their PowerPoint presentations. Interactions with faculty in the U.S., from Wei's perspective, were much richer. Students were able to ask questions during class and were encouraged to interact with the faculty and teaching assistants outside of class. Overall, it seems that both the faculty and teaching assistants were more accessible to the students in the U.S.

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Additionally, the group project was new to the students. Many had never worked as part of a team before. Some reported that group work is not a common part of courses in China. For multiple participants, the group project was the highlight of their experience. They learned how to work collaboratively and produced an impressive final product. Considering the interview data in the aggregate, one could reasonably conclude that participants found the most value in experiencing American culture through the program. According to Zixin:

> My favorite part was that the program showed me the daily lives of studying at a USA university. As I said, how to arrange the time, how to interact with the professors and the students. The experience was more important than the presentation and research topics to me.

The workshop's design and the work it entails are comparable to a graduate-level course in the U.S. Lectures are paired with independent research and projects, giving participants a small taste of what to expect as a master's or Ph.D. student in the U.S. Additionally, graduate teaching assistants are used to help the students navigate the workshop and share more insight into the life of a graduate student. This topic arose frequently in the interviews. Whether or not the participants liked the academic portion of the program, most mentioned that it had provided an idea of what they would encounter in pursuit of advanced degrees. For some, this taste of graduate student life dissuaded them from pursuing a Ph.D. For others, it confirmed the choice to enter a Ph.D. program was the correct one. Most participants found the rigor and activities required of the program to be valuable.

Several students attended the program without having any background in computer science. The different majors of the participants include physics, mechanical engineering, mathematics, atmospheric science, and rail traffic signal and control. Students who did not have a background in computer science prior to the workshop seemed to get less out of it academically than those who did. Shu, for example, majored in atmospheric science. While he enjoyed the social and cultural aspects of the program, he felt the lecture content was too difficult for him to master. He left the program having learned little about deep learning. As expressed above, Li had no previous knowledge of deep learning and struggled to keep up.

Interestingly, even those who struggled in the academic portion of the program due to their background knowledge deficits found the program to be worthwhile. Gaining experience in an American classroom, learning to communicate with professors, establishing strong relationships with peers, and experiencing American culture were cited as benefits of the program that outweighed any negative academic experiences. All viewed the experience positively and indicated that they would do the program again if given the chance.

## Establishing Faculty Connections

A key recurrent theme in the interviews was the faculty connection. Many interviewees expressed their desire to connect with faculty members at SRU through the program. For some, this desire was transactional, motivated by the hope that faculty would provide a

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letter of recommendation for graduate programs, as explored above. Many of the students who listed this as a goal were successful.

Others hoped to make faculty connections because they had not been able to do so in China. During the program, students are encouraged to interact with the faculty both inside and outside of lectures. Jing explained that the opportunity to make faculty connections was new to him. He credits the short-term program with helping him learn how to communicate with professors. Yan shared that it is difficult to communicate with professors and teaching assistants in China, but he had no difficulty doing so at SRU. Wei echoed this sentiment, explaining that faculty in China are eager to teach what is on the PowerPoint as quickly as possible rather than engaging in discussion with students. Ming found the professor to be extremely friendly and approachable, always providing detailed and coherent answers to student questions.

In addition to interaction in the classroom, students reported being able to form connections with the faculty outside of their classroom. Tao describes attending his professor's office hours on several occasions, where he received a lot of good advice and answers to questions he felt too shy to ask in class. Li explains that he found the professors to be very accessible and reports meeting with his mentor faculty member frequently. Jing was able to get advice from a professor on how to set up a professional robot team and even got to visit his lab.

However, some participants had a more negative experience in terms of creating faculty connections. As Wei explains:

> The workshop arranged for several faculty in different fields to introduce an area of his research and the latest progress. A faculty would probably only teach us once or two times, and then change to a new faculty after the lecture. So, it [was] hard for us to communicate with one faculty in-depth, but when we were in class, we could easily talk with the faculty…In a word, our interaction will be richer in class, but after the class, we may not continue to follow up and continue to communicate with the faculty.

Nevertheless, Wei was able to form valuable faculty connections by volunteering to be an assistant to help arrange the activity the students do outside of class.

Yan found that he also struggled to make faculty connections. Yan knows that he is a shy person and has difficulty connecting with others in general. While other students reached out to the professors outside of class and asked for recommendation letters, Yan limited his interaction with the faculty to discussions of the research. This was also true for Bao, who waited until the very end of the program to reach out to a faculty member. His chief suggestion for future workshop enrollees is to proactively reach out to professors, as he wishes he had. Donghai's interactions with the faculty were hindered by his English skills. Like Tao, because he did not feel comfortable expressing himself in English, Donghai rarely asked questions or engaged with the faculty during lectures.

A virtual participant in 2020, Mei also felt that she did not create strong faculty connections during the program. Though she shared that the teacher held daily meetings with her and two other students, it seems as though she did not find these meetings to be enough of an opportunity to connect with the faculty.

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> I [thought I could] learn a lot from the teacher in this project and publish papers. But in fact, the teacher met us a few times. Maybe because the teacher was busy, most of the knowledge still depended on self-study and did not publish papers in the end. I feel that the connection with the teacher is a little far away.

Whether faculty connections were spoken about positively, or, in the case of Mei and Wei, more negatively, this theme was ever-present in my interviews. Those with positive experiences with faculty and strong connections shared more positive feelings and fewer criticisms about the program. Mei, who felt she did not have a strong connection to the faculty, was the only participant to say she would not repeat the experience if given the chance. It seems that students want a faculty connection, and their overall perceptions of the program were at least somewhat dependent on the quality of those connections.

### Communication Challenges and Opportunities

Another theme that is present in the interviews in relation to perceived program value and lived experiences od participants is communication. All participants are native Chinese speakers, with varying levels of experience speaking English. The short-term program was conducted entirely in English. While some identified this as a challenge in their program, others see it as an opportunity. Whether or not these struggles were looked at in a negative or positive light seemed to impact participants' overall perception of program value.

Students in the program were required to speak in English during classes and write the assignments in English. Tao highlighted this as a challenge. He mentioned that the professors seemed to be speaking quickly. Sometimes, he could understand what each individual word meant, but not the sentences or concepts as a whole. To combat this problem, he reported asking the professor for the slides and reviewing them on his own or with a Chinese-speaking teaching assistant. Fang reported similar struggles, finding it difficult to use English both in the classroom and in daily life at SRU. Jing describes his difficulty with communication this way:

> I think the language is a big problem because it was my first time to come to United States. So even daily communication is hard for me to deal with it. I think at the time, I let myself be brave to communicate with others. And I could learn some of their experience expressions by communicating with them. But in fact, I haven't solved this problem yet. I'm still working on how to communicate well with others.

This struggle to communicate in the English language seemed to affect many of the interviewees. For Donghai, it proved to be a barrier to forming faculty connections. Even those who felt their English skills were good prior to the program, like Donghai, found they were inadequate once in the U.S. Donghai's only regret from the program was that he was not able to interact with the faculty as much as he would have liked. He suggested the program add some sort of English language orientation on the first day to provide students with the language skills they will need to successfully complete the program. Nevertheless, even with the language difficulties, Donghai was very happy with his overall experience.

Though speaking and writing in English so frequently was a new experience for these students, many identified this as a growth opportunity. Tao, for example, credits the

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program with greatly improving his English speaking and writing skills. Fang also saw this as a good chance to practice speaking English more and improve his conversation skills. As previously highlighted, some participants also found learning in English to be an opportunity, as nothing was lost in the translation of the textbooks from English to Chinese. As most of the enrolled students had plans to pursue graduate study in the US, the program provided a unique opportunity to experience learning in English. Some felt this gave them a boost in their graduate school applications, helping them to stand out from other competitive Chinese applicants who may not have had such experience.

The language barrier certainly posed a challenge for many of the interviewees, but many were also able to as well see the positive in the experience. For some, the struggles with the English language actually enhanced their perception of the program's value. While others felt that there could have been improvements to the program in this area, it did not seem to detract from their overall perception of program value, as fourteen out of fifteen participants said they would choose the program again if given the opportunity.

### Skill Acquisition and Development

Students' previous experience and education also seemed to play a role in their experiences in the program. The project portion of the program involved the use of computer programming software, Python. Those who had not learned Python previously encountered some difficulty with the academic portion of the workshop. Donghai, for example, felt that it was too hard to learn Python on his own during the short program, so he worked on other parts of the project and let his teammates do the programming. Others, like Qiang, Li, and Zixin, learned Python on their own and through their groupmates. Qiang says, however, that he did feel behind compared to his peers who already had Python experience and were able to focus exclusively on the deep learning content.

Likewise, Li shared: "First, I didn't have any background in deep learning, and I didn't learn Python before. So, it was difficult for me at the beginning. It's a challenge for me to catch up with the knowledge. I learned Python by myself through a few days." Zixin, who was a mathematics major in college, felt the workshop was actually good for people who are new to the field of computer science. "It introduced Python and some basic deep learning algorithms to me. I learned how to do a project, which is a very good experience," he said. Similarly, though he struggled to learn Python, Qiang saw this challenge as an opportunity to learn a new skill that would serve him well in the future.

Most participants reported experiencing some sort of the change in their soft and hard skills after completing the workshop. Some acquired entirely new skills; others further developed existing ones. Learning how to code using Python was a hard skill that many students acquired during the program. The program did not provide any formal instruction on Python, so students were forced to learn it on their own or through groupmates to successfully complete the final project. Though many students struggled with learning Python, as explored earlier, they were able to add a new skill to their resumes. Li says this helped him to earn some other internships and opportunities later. Qiang also shared that this was helpful in his future studies. Multiple participants reported gaining experience conducting research, a skill they employed throughout their graduate studies. Finally, many interviewees shared that they experienced marked improvements in their English speaking, reading, and listening skills.

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Additionally, several participants reported the development of their soft skills. Wei was able to gain more leadership experience through his role as a program assistant. All participants improved their interpersonal skills by learning how to work collaboratively. They also reported learning to better communicate with peers, faculty, and others. The group project required students to use problem-solving skills, learn how to manage a project from start to finish, and overcome any obstacles that arose.

Enhancing new skills and developing new ones was a major positive for many of the interviewees. They reported that their soft and hard skill gains proved valuable in both their academic and social lives following the program. Those who continued studies in computer science-related fields were able to put their Python knowledge to use. Research experience also proved to be valuable for many in graduate school. Additionally, learning to work collaboratively and communicate effectively assisted with success in advanced degree programs. It is evident that much of the program's perceived value comes from the opportunities it provides to learn and develop skills.

### Graduate School Decision-Making and Admissions Processes

Another key theme that emerged from the data was the role of the short-term program as it pertained to participants' graduate school decisions and their graduate school admissions process. Participation in the program had a significant impact in these areas, which is one of the biggest contributions to the body of research on short-term study abroad programs. All participants entered the program with plans to pursue a graduate degree, whether in the U.S. or elsewhere. The majority of participants reported having a desire to pursue graduate study in the U.S. before enrolling in the program. Their experience in the program served to either confirm or alter these plans. For some, like Jing, Tao, Yan, and Li, graduate study in the U.S. was already in the plan, and participating in the program solidified this plan. They enjoyed learning at an American university and experiencing the culture.

While many participants saw the program to determine whether or not they would like to study in the U.S., a theme surrounding aptitude for graduate study emerged. The experience in the short-term program caused several participants to evaluate whether they were cut out for graduate programs. For some, this question was answered affirmatively. Yan and Li, for example, confirmed their interest in engineering and found that they did have what it takes to pursue a master's degree in the U.S. Fang entered the program feeling confident about his aptitude to pursue a master's and then a Ph.D. in the U.S., and the program confirmed this feeling. He is now completing his master's at SRU and starting his Ph.D.

For others, however, participation discouraged them from pursuing a Ph.D. and instead of seeking a master's degree. Mei explained that her interactions with doctoral students through the short-term program helped her to gain a better understanding of what is involved in doctoral study. These conversations led her to conclude that she does not have the scholastic aptitude to pursue a Ph.D. and that she should seek a master's degree instead. Similarly, Tao changed his mind about pursuing a Ph.D. after completing the program. He found that he does not like conducting research and worries that doctoral study will be too difficult for him. He has decided he would rather earn a master's degree in the U.S. and then enter the workforce.

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For others still, the program helped to clarify which educational path to the Ph.D. they should pursue. Zixin learned from his conversation with a program professor that it would be best for him to pursue a master's degree and then a Ph.D., as his undergraduate background was not in computer science. Qiang was not sure whether to earn a master's degree and then a Ph.D. or enter directly into a Ph.D. program. Conversations with his girlfriend during the short-term program convinced him that pursuing a Ph.D. instead of a master's degree was the right choice.

Additionally, some participants shared that the short-term program helped clarify their academic interests. Though Bao knew going into SRU that he was interested in studying either machine learning, deep learning, or artificial intelligence, completing the artificial intelligence project revealed to him that this was the topic he wished to learn more about. Qiang learned that he was not good at coding and preferred instead to study a topic that involved more theoretical research. In discussing his hope to pursue a graduate degree in marketing rather than computer science as he had in college, older students helped Yan to see that it would be difficult for him to change fields. He also realized that having an advanced degree in computer science would be very useful.

The short-term program at SRU also had an impact on school choice for some. Several participants chose to pursue their advanced degrees at SRU. Jing explained that, during the program, he was able to make connections with SRU faculty members. Moreover, the experience was so enjoyable for him that SRU quickly moved to the top of his list of graduate programs. "After the workshop, I took [SRU] as my dream school. And before that, I probably prefer the universities located in the city or downtown. But after that, I prefer [college town]. I think the environment is pretty good," he explained.

Most of the program participants shared that the short-term program impacted their graduate school applications and admissions process in some way. This was primarily evident in the context of letters of recommendation. Jing described his faculty connections as the "bridge" that helped him get from the short-term program at SRU to enrollment in the engineering program. His faculty mentor was able to write him a recommendation that helped in his admission. Fang lists his desire to get a faculty recommendation for graduate study from a US professor as one of his primary motivations for choosing to attend the workshop in the first place. He felt this will help compensate for his GPA, which he believed was not good enough to apply for the top graduate programs in the U.S.

One participant felt the program did not live up to her expectations about letters of recommendation. According to Mei, she was told by her study abroad consult agency before selecting the program that participating in this program would result in letters of recommendation for admission to graduate study. She asked a faculty member to write letters for Durham University, the University of Southern California, and New York University. Ultimately, the professor wrote one letter—to NYU. Though she was accepted to NYU, Mei was disappointed that the professor did not provide her with recommendations for the other schools.

Other interview responses indicated that the program had a positive impact on the graduate school application process. The graduate student assistants for the programs were able to provide valuable insight into the admissions process and guide the students as they applied. Li explains "there are some mentors who shared their experience in applying for

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U.S. graduate schools. I think those conversation[s] are very helpful for us to learn what the application process is for applying graduate school in the U.S."

The graduate students working with the program also helped the participants to set expectations about graduate study. Mei, for example, credits the teaching assistants with teaching her more about doctoral programs and what is required. Their input ultimately helped her make her decision about whether to apply for a master's or Ph.D. program.

Interaction with the graduate students was not the only aspect of the program that helped participants with the graduate school application process, however. Several participants indicated that interacting with their like-minded peers throughout the program was especially helpful in navigating program admissions. Wei, Tao, and Yan expressed that since all participants had common goals of pursuing a graduate degree abroad, it was very helpful to discuss graduate programs and application requirements together. They helped each other to prepare for the TOEFL and GRE, as well as shared good news about their applications.

Many participants felt that their participation in the program gave them an advantage in applying to graduate school. Apart from the faculty letters of recommendation, which proved to be valuable, some participants believed their experience studying and learning in English was beneficial in their application to U.S. graduate schools. Compared to other competitive foreign applicants, the short-term program participants felt they likely had more experience with the language of instruction, which would impress admissions committees. Others felt the experience of conducting research was a resume booster that gave them an edge in admissions. This was especially true for participants who went on to pursue graduate degrees in computer engineering, for whom the deep learning and robotics workshops were directly relevant to their future field of study. Several participants mentioned that the project they completed was impressive to add to their resumes, and they felt it enhanced their overall application.

## Discussion and Implications

This study explores the perceptions, lived experiences, and graduate school decision-making of overseas short-term STEM program participants. Taken together, the key themes drawn from interviews with 15 international students highlighted the importance of experiences related to sampling American education and culture, establishing faculty connections, communication-related challenges and opportunities, skill acquisition and development, and graduate school decision-making and admissions processes.

Prior work has demonstrated that short-term programs can significantly help with students' language improvement as one clear benefit of participation (Carroll, 1967; Cubillos & Ilvento, 2012, Dickinson, 2015; Lord, 2006; Stewart, 1999). Intensive second language exposure even for a few weeks can make a huge difference in learning a second language and studying abroad for a short time makes significant linguistic gains (Grey et al., 2015). This study confirmed existing findings, indicating that students felt their English skills had been improved during the programs. Students are forced to use English in their daily conversation, which created plenty of opportunities for students to improve their English skills, especially in listening and speaking. Many of the participants in this study mentioned

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that the programs laid a great foundation for their future graduate studies because of the improvement of their English communication skills.

As for long-term benefits, Ruth et al. (2019) noticed that short-term programs can contribute to participants' career success through professional connections established in the programs and the improvement of specific skills. These studies also enhanced this benefit because many students self-reported that they thought participating in the programs helped them with their graduate schools' applications. Specifically, students got recommendation letters and professional guidance through the connection with faculty and teaching assistants, and students also got support from their peers in their application process. Ludwig (2000) proposed that short-term programs can be used as a recruitment tool for universities to attract prospective students, which is supported by the fact that 27% of interviewees in this study eventually attended SRU after participating in SRU's short-term programs.

However, this study also reinforced the evidence of the negative perceptions of the lived experience of short-term study abroad programs. For example, Kamdar and Lewis (2015) found that short-term programs did not always make significant academic progress for participants in the brief time allocated for the overseas short-term program. This study shows that many students felt they did not learn deep enough regarding academic areas and suggested that the programs should give students more time to explore the campus life and other aspects of the culture of the American higher education experience.

One important contribution of this study is the finding that an overseas short-term program can influence participants' graduate school decision-making. Participants can test out academic and social life in the U.S. before committing to a longer program. The content of the program can help clarify academic interests and appropriate degree paths, while peer interactions can aid in successfully navigating the admissions process. Though this data cannot reveal a causal link between the short-term program and graduate school choice, examining participant responses about program design supports a conclusion that an enhanced program design could suggest that more students will eventually enroll in the host school for graduate study. Importantly, this study can help higher education administrators to gain insight into the peaks and pitfalls of short-term study abroad programs. Keeping and enhancing the elements of this program that worked well and re-vamping those that did not will help to ensure that the desired outcomes of both the students and the institutions are achieved.

Experiencing culture in the U.S. was another highlight of an overseas short-term program for nearly all participants. The interview data also revealed that participants' perception of the program's value was at least somewhat dependent on their expectations upon enrolling. For those who expected to gain some general knowledge of the topic and have a taste of American academics and culture, the experience was viewed extremely favorably. For those who expected a more rigorous academic program, faculty collaboration, and published research papers, it was viewed somewhat less favorably but still considered valuable overall among program participants. The same was true for those who did not expect that their lack of computer science and Python experience would be a hindrance. Thus, setting clear, specific expectations about what the program does and does not involve prior to students' enrollment would be beneficial.

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### Robust Orientation and Support

Another lesson emerging from the data is the need for robust program orientation and targeted support for those who may struggle with specific aspects of an overseas short-term program. SRU's program jumps right into academic content, without any formal orientation to the campus, the program's agenda, or the language and culture. Moreover, there is no formal support for students who may struggle with the different skills required to successfully navigate both the academic content and life in the U.S. This was something participants would have benefited greatly from.

Given that one objective of short-term programs is to serve as a recruitment tool for graduate study at the host university, a campus tour to begin the program would be useful. Students should be shown the resources available to them and given a better sense of campus life. Only four of the fifteen participants in this study continued their graduate studies at SRU, which may be partially attributed to students' lack of connection to the campus.

Future research can further explore the impacts of tutoring in Python or other coding languages would enhance participants' experience in an overseas STEM short-term program. If a given short-term STEM program wishes to continue admitting students from different backgrounds and levels of technical experience, it should also provide them with the preparatory tools participants will need to be successful. Though most participants were able to learn Python on their own or from peers, it detracted from their overall learning experience. Several participants noted they were not able to focus on acquiring deep knowledge to the same extent as their peers who were well-versed in the programming language, and this specific consideration can be the subject of further inquiry.

## Declaration of Conflicting Interests

There is no conflict of interest to be cited here.

## Funding

The author received no funding/ financial support to conduct this research.

## Human Participants

This study included human participants and was approved by the University of Florida's Institutional Review Board.

## Originality Note

I confirm that this is an original research study that is not under review elsewhere. Any reference to outside work has been cited appropriately within the manuscript.

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## APPENDIX A: INTERVIEW PROTOCOL

Introductions and Purpose of the Project

Ensure confidentiality and voluntary participation

Explain why their views and voice are important

Ask about the participant's preference of language

Ask participant if they have any question at this point

"Thank you for your time and wisdom as we humbly approach this work."

Part A. Brief life history

1. Please tell me something about yourself.
2. Could you share your college experience in China with me?
3. Do you plan to apply to a graduate school in the U.S.? If so, how did you make this decision?

Part B. Experience during the short-term overseas program

4. What motivated you to participate in the short-term program at F university?
5. What were your expectations for this program? Were they achieved? If no, please share some unexpected things with me.
6. What kinds of learning and growth have you attained through participating in the program?
7. Did you face any problems during this program? If yes, how did you deal with them?
8. Please describe a typical day during the program.
9. Please describe your interaction with the mentor faculty in this program.
10. Please describe your interaction with your peer students in this program.
11. What is your favorite part of the program?
12. Is there anything you would like the program to improve?

Part C. Self-reflection after the program

13. Will this program experiences change your future study abroad plans, such as the location, dream school, academic major, level of study (master or doctoral degree)?
14. How do you think this piece of experience would contribute to your success in admission?
15. If you could go back, would you still choose to participate in this program?
16. Is there any other information about your experience during the program you'd like to share with us?

Thank you so much for your time and dedication to this effort!

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## APPENDIX B: INFORMED CONSENT FORM

Project title: The Experiences of Chinese STEM students in Short-term Programs in the U.S.

Purpose of the research study

The purpose of this study is to explore the experiences of Chinese STEM students who participate in a short-term overseas program in an American university and the effects of program experience on their later graduate school decisions.

What you will be asked to do in the study

As a participant, you will be asked to answer some questions about your experiences during and after the short-term research program/workshop in an online interview.

Time Required

Approximately 45-60 minutes.

Risks and benefits

There are no known risks associated with participation in this study. Participation in this research is strictly voluntary. Declining to participate will in no way affect your participation in any initiative. Participation in this study will give you a voice as an important member in transnational Chinese community.

Compensation and voluntary participation

There is no compensation and no cost to you. Participation in this research is strictly voluntary. You are free to withdraw your consent to participate and may discontinue your participation in any part of this research at any time.

Confidentiality

Participation in this study is confidential. The interview does not ask for any information that would identify who the responses belong to. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared because your name is in no way linked to your responses.

Focus group participants should be advised that although the researchers will take every precaution to maintain confidentiality of the data, the nature of focus groups prevents the researchers from guaranteeing confidentiality. The researchers would like to remind participants to respect the privacy of your fellow participants if you participate in a focus group interview and not repeat what is said in the focus group to others.

Individual interview participants have the choice to waive confidentiality and give consent to use your name, school, role in education, or other relevant identifiers in publication or report. If you would like to allow your identifying information to be shared publicly, please sign check here.

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***International Students & Short-Term STEM Program***

I agree to waive confidentiality, and I give consent to use my name and other relevant in any publication or report related to this study. I understand that I may be quoted directly or paraphrased.

Right to withdraw from the study

You have the right to withdraw from the study at any time without any consequence.

Whom to contact about your rights as a participant in this study

Please sign the electronic copy of this agreement if you are willing to participate and keep a second copy is included for your records. If you have any questions about this study, please contact the researcher at [email]. If you have any questions about the rights of research participants, you can contact the SRU Institutional Review Board Office.

Agreement

I have read the procedure described above for the transnational Chinese families in the pandemic project. I agree to participate and have received a copy of this description.

Participant Signature: _____Date: _____

Researcher: _____ Date: _____

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## APPENDIX C: EXAMPLE OF OPEN CODING
### RAW INTERVIEW DATA

Raw Interview Data:

I did think about that, because U.S. universities have lots of classic and advanced classes in machine learning and other computer science related area. For example, I know there is a machine learning open class in Stanford and it is very clear and detailed for many aspects in machine learning. And I think I would come to united states for my master's degree. Besides, if I get a master's degree in united states, I will get more opportunities to get a better job. There are more job opportunities in the U.S. than my home country.

Open Codes:

Advanced classes, job opportunities in the U.S.

Raw Interview Data:

For this program, I think the first learning should be the improvement of English. I only talked in English at classes in China. But when I came to united states, I have to speak it during the class. When I ask a question to a professor, I need to speak in English. Besides that, my writing skills also improved a lot because all documents were required writing in English. Overall, my English speaking and writing skills have improved a lot.

Second, I gained some knowledge in machine learning, and we did a fantastic project. I am very happy about my achievement. Besides, I was so excited to know people from different schools in china. We had lots of conversation about daily life and shared our experience with each other. It's great to know so many good friends.

Open Codes:

English language proficiency, skill improvement, subject specific knowledge acquisition, project completion, peer relationship-building

Raw Interview Data:

First it was my first time went to the United States. The summer camp not only takes you to participate in various academic activities, but also takes you to experience the U.S. environment. Such as go to some of the famous scenic spots there, and even go shopping at some of the famous supermarkets. It was also the first time for me to come into contact with a living environment completely different from China, and to live in that environment to experience the feeling of eating, drinking, playing and having fun at that time. My vision is broadened, and the summer camp has given me a firm determination that I want to study abroad to go outside and live in a completely different environment for a period.

Open Codes: academic activities, cultural activities, exposure to different lifestyle, confirmation of desire to study abroad.

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**Dr. Yunxi Qu** is an independent researcher and recent graduate from the Ph.D. program in Higher Education Administration & Policy at the University of Florida. Dr. Qu's research interests include the motivations and experiences of international students in STEM degree programs, particularly Engineering degree programs.

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