

Impacts of STEM-Centered Short-Term Study Abroad Course on Pre-Service Teachers' Culturally Responsiveness and STEM Teaching Efficacy

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Abstract—While short-term study abroad experiences are the dominant study abroad model, study abroad research primarily focuses on studies connected to semester or year-long programs. Researchers claim that short-term study abroad programs, particularly with a STEM education focus, are under evaluated. This pilot study aims to address that gap by investigating the impact of a two-week STEM-focused study abroad program in the Netherlands on elementary pre-service teachers (PSTs). The study utilized a pre-post survey analysis measuring PSTs' culturally responsive and STEM teaching efficacy. It is widely known that minutes of science instruction at the elementary level is limited. If you consider that many students have had negative personal experiences with STEM in their own K-12 education, we must find ways to increase their efficacy and break this cycle. This discussion will be of interest to other STEM methods instructors, study abroad leaders, and PST educators.

Keywords— Short Term Study Abroad, Elementary Pre-Service Teachers, Culturally Responsive Teaching, STEM Teaching, Pre-Service Teacher Self-Efficacy.

I. INTRODUCTION

STEM Teacher education is a unique area in the short-term study abroad scene (Brennan & Cleary, 2007; Kuechle et al., 1995; Rhodes & Milby, 2016; Willard-Holt, 2001). There is increased pressure on teacher education programs to develop PSTs' intercultural competencies (Dunn et al., 2014), their sense of global citizenship (Brown, R.M. & Tignor, S.E., 2016; Demetry, C. & Vaz, R.F. 2017; Duke, S.T. 2020; Tarrant, 2014), and to increase their awareness and appreciation of other educational systems (Phillion et al., 2009). By providing immersive and reflective experiences, study abroad programs contribute significantly to the development of self-efficacy, preparing PSTs to navigate the complexities of diverse classrooms with confidence and cultural competence. Integrating short-term study abroad into teacher preparation programs is a strategic investment in shaping globally minded educators equipped to meet the challenges of 21st-century classrooms.

While study abroad participation increases steadily, PSTs have only been about 4% of that group over the past twenty years. Short-term study abroad programs offer preservice teachers an opportunity to expand their perspectives, both culturally and professionally (Brown, R.M. & Tignor, S.E., 2016; Demetry, C. & Vaz, R.F. 2017; Duke, S.T. 2020; Dunn

et al., 2014). Exposure to different educational systems, teaching philosophies, and classroom dynamics fosters adaptability and cultural competence. The firsthand experience of navigating unfamiliar educational landscapes contributes to PSTs' mastery experiences, positively influencing their self-efficacy in handling diverse teaching scenarios (Siwatu, 2007).

As experts in our field, it is common knowledge that minutes of science instruction at the elementary level is limited. An initial discussion during students' science methods course is to describe what science looks like during their field work. An overwhelming number of comments are connected to the lack of regular science instruction they have observed. If you consider that many students have also discussed negative personal experiences with STEM in their own K-12 education, we must find ways to increase their efficacy and attitudes and break this cycle. Understanding impactful components of a short-term study abroad STEM experience on our PSTs' cultural competencies provides a unique learning opportunity beyond the traditional teacher education program. It is important for PSTs to understand what the qualities of equitable STEM instruction truly look like. The goal of this work is to begin a discussion on how educator preparation programs can establish study abroad experiences as best practice. Additionally, it will be of interest to STEM methods instructors, study abroad leaders, and PST educators.

II. LITERATURE REVIEW

2.1 Teaching Self-Efficacy

Teaching self-efficacy refers to a teacher's belief in their own capabilities to plan, organize, and execute courses of action required to successfully accomplish specific teaching tasks and goals. It is rooted in Albert Bandura's (1977, 1995) broader concept of self-efficacy, which is the belief in one's ability to perform tasks and influence outcomes in a particular domain. In the context of teaching, self-efficacy is specific to an educator's confidence and perceived competence in their teaching abilities and their impact on student learning. The research literature on the significance of teachers' self-efficacy is well established (Knoblauch & Woolfolk Hoy, 2008; Putnam 2012). Teachers who have greater confidence in their teaching abilities try new methods and are more persistent with their struggling students (Haney et al., 2002; Nurlu, 2015), place greater importance on building relationships with

students (Nurlu, 2015), engage in more professional development opportunities (Gersten et al., 2000), and provide higher levels of academic focus in the classroom (Gibson & Dembo, 1984).

As the teaching profession continues to evolve, recognizing and nurturing the self-efficacy of PSTs emerges as a fundamental responsibility of teacher preparation programs. The implications of PSTs' self-efficacy are far-reaching, significantly impacting the quality of education in their future classrooms, as a significant amount of research suggests that teacher's self-efficacy impacts students' academic outcomes (Burić & Kim, 2020; Klassen et al., 2011; Klassen & Tze, 2014; Künting et al., 2016; Perera & John, 2020; Zee & Koomen, 2016). Teacher preparation programs must recognize the pivotal role they play in shaping and enhancing self-efficacy among their candidates. As PSTs develop a strong sense of efficacy, they are better equipped to navigate the complexities of the teaching profession, resulting in enhanced instructional practices and positive student outcomes.

By fostering a sense of competence and resilience, teacher education programs contribute not only to the individual success of PSTs, but also to the overall efficacy of education systems worldwide. The construct of self-efficacy can be used to provide researchers with a solid theoretical framework for designing and evaluating teacher preparation programs with a goal of increasing instructional strategies to effectively teach in diverse classroom settings and in all subject areas. The following sections will examine the literature on culturally responsive teaching and STEM instruction through the lens of PSTs' self-efficacy.

2.2 Preservice Teachers' Culturally Responsive Teaching Self-Efficacy

In an era characterized by increasing cultural diversity within educational settings, PSTs' self-efficacy in culturally responsive teaching is a critical factor influencing the equitable and inclusive nature of their instructional practices (Brown, R.M. & Tignor, S.E., 2016). Culturally responsive teaching self-efficacy extends beyond the conventional understanding of self-efficacy, encompassing the PST's confidence in engaging with diverse student populations and adapting instructional practices to meet the needs of a multicultural classroom.

In many educational settings, especially in diverse urban areas, the student population is often more racially and ethnically diverse than the teaching staff. According to the National Center for Education Statistics (2023), the percentage of non-white K-12 public school students rose from 48% in 2010 to 55% in 2021. Yet, during this same period, the percentage of white school teachers stayed relatively constant at roughly 80%. The disparity between the racial makeup of schools and the representation of white teachers is a persistent issue in many educational systems, particularly in high needs areas. This disparity has implications for the quality of education, cultural relevance, and the overall experiences of students. A lack of racial diversity among teachers can result in a disconnect between educators and their students. This

leads to potential challenges in addressing the cultural needs of diverse student populations to maximize learning opportunities.

Culturally responsive teaching is an educational approach that values the diversity of students in the classroom by incorporating their cultural backgrounds, experiences, and perspectives into the teaching and learning process. This approach goes beyond acknowledging cultural differences; it actively seeks to create an inclusive, equitable learning environment that respects and leverages the unique strengths of each student. Gay (2018) further describes it as, "using the cultural knowledge, prior experiences, frames of reference, and performance of ethnically diverse students to make learning encounters more relevant to and effective for them" (p. 36).

The self-efficacy of culturally responsive teaching is based on Bandura's (1977) social cognitive theory, which is intertwined with cultural frameworks for instruction (Demetry, C. & Vaz, R.F. 2017; Duke, S.T. 2020; Siwatu, 2007). It extends the traditional concept of self-efficacy to encompass a PST's belief in their capacity to understand, respect, and effectively teach students from diverse cultural backgrounds. As Siwatu (2007) states:

As efforts to train culturally responsive teachers grow, teacher educators must make certain that teacher education candidates (1) are effective at implementing the practices of culturally responsive teaching and (2) have faith in the beneficial results of this instructional strategy. ... these beliefs may predict whether PSTs implement these culturally responsive teaching practices once they enter the classroom. (p. 1087)

Teacher preparation programs play a pivotal role in cultivating culturally responsive teaching self-efficacy among PSTs. Beyond the traditional components of teacher training, programs must incorporate explicit strategies to enhance cultural competence, provide meaningful field experiences in diverse teaching contexts, and foster critical reflection on their own cultural assumptions. Mentorship programs, community engagement, and immersive experiences in culturally diverse settings contribute to the development of PSTs who are not only efficacious in their instructional abilities but also adept at creating inclusive and culturally responsive learning environments.

2.3 STEM Teaching Self-Efficacy

Elementary students come into their classrooms with various ideas about the world around them and continue to be influenced by teachers, families, friends, and their own sense making during science instruction (Brown et al., 2000). There can be a sense of disequilibrium with these ideas when students come to school and learn that this sense making may differ from what the teacher is explaining (Campbell et al., 2016). It is important to have STEM experiences that combine the reasoning with the natural world and how to gather evidence to support their claims. Connecting students to the world around them while exploring scientific and mathematical ideas supports culturally responsive teaching

practices (Gay, 2018). This means that PST self-efficacy in STEM is important to foster. Teachers must have confidence in their capacity to teach STEM topics well. Outside of the education community it is thought that every content area would be a part of daily classroom instruction. However, it is well known in the research that lower STEM self-efficacy leads to less instructional time devoted to these areas, particularly in science (Conderman, 2008; Davis, E. A., & Stephens, A., 2022; Durrance, 2020; Milner et al., 2012; Tilgner, 1990).

In the context of PSTs in STEM education, self-efficacy plays a crucial role in shaping their attitudes, motivations, and behaviors as they prepare for their future teaching careers (Davis, E. A., & Stephens, A., 2022; Durrance, 2020; Milner et al., 2012). According to the 2018 National Survey of Science & Mathematics Education, elementary teachers' perceptions of their preparedness to teach science was only 31% as compared to 73% for mathematics and 77% for reading and language arts. Teachers teach what they feel prepared and comfortable teaching with. Teacher preparation programs still mirror the siloed structure of K-12 education by isolating subject areas in teaching and university methods coursework. While elementary teachers are at an advantage by having their students all day, there is a lack of integrated approaches to subject area teaching. Additionally, the adaptation of the Common Core Mathematics Standards and Next Generation Science Standards (NGSS) in K-12 education, pushes for classrooms to support a student-centered classroom model. Educator preparation programs must prepare PSTs to create active learning experiences and be facilitators in the learning rather than the gatekeepers of knowledge (Brown 2019).

While the literature agrees that, in general, PSTs lack a strong sense of STEM efficacy, there is a lack of research on efforts to improve this at the educator preparation level (Bell et al., 2019). Even within our own educator preparation program, changes in course of study sequences are typically made as the state's department of education updates their requirements, not because of any internal research. Additionally, if we consider that there is low self-efficacy among practicing STEM educators, then we must consider that impact on our PSTs' ability to grow in their own STEM efficacy while in those placements.

2.4 Experiential Learning

An important factor in the determination of a teacher's sense of efficacy is experience, or what Bandura (1977) calls performance accomplishments. Do teachers believe that their teaching can make a difference in student learning? What parts of an educator preparation program build this efficacy? Hoy (2000) states that mastery experiences during student teaching and the first year of teaching have the most powerful influences on teacher efficacy. Instructors who teach student teaching seminars witness this first hand each semester. It is important to go deeper and see how educator preparation programs can investigate and incorporate other impactful experiential learning experiences before students reach the student teaching point in their program.

What role can study abroad play to support this goal and expand how we prepare PSTs for global classrooms? Vande Berg et al. (2012) discusses how the transformational aspect of experiential study abroad experiences and travel can broaden student thinking. However, Fisher, et al. (2022) state that it is difficult to reach consensus in study abroad research due to the information primarily being connected to semester or year-long programs despite short-term experiences being the dominant study abroad model. They state that short-term study abroad programs are under evaluated. The other confounding factor is that even if multiple people participate in the same program, they will likely not make meaning in the same ways (Berger & Luckmann 1967). It is important to have more data about the concrete ways that students have been impacted after participating in a study abroad experience. Additionally, how does a joint experience impact their teacher identity development? The hope is that students can develop personally and professionally through an intentional study abroad program design. Immersion experiences are ideal opportunities to connect experiential and constructivist ideas (Brown, R.M. & Tignor, S.E., 2016; Vande Berg et al., 2012). Participants in a study abroad program are impacted individually and as a group through joint experiences. The potential for those learning transactions can be even deeper when there are interactions with participants from various cultural backgrounds. Each learner is bringing something to the experience and growing in how they see the world. Students can see different approaches to teaching and learning that they would not experience if they had not been a part of a study abroad experience.

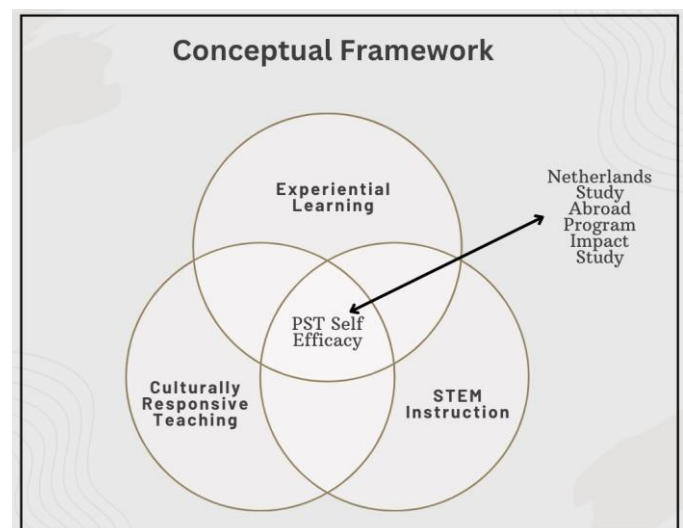


Fig. 1. Conceptual Framework Venn Diagram

The gap in the literature addressed by this study lies within the intersection between culturally responsive teaching, STEM instruction, and experiential learning, with PSTs' self-efficacy being subjected to all three during a study abroad experience. Figure 1 is an illustration of this intersection, giving a conceptual look at the purpose of this study.

III. METHODOLOGY

3.1 Research Questions

1. In what ways does a short-term study abroad experience impact PSTs' culturally responsive teaching efficacy?
2. How does a short-term study abroad experience impact PSTs' STEM efficacy and attitude?

3.2 Research Design

This project is connected to a two-week STEM-focused study abroad program at a university in the Netherlands. According to the 2018 National Survey of Science & Mathematics Education, elementary teachers' perceptions of their preparedness to teach science was only 31% as compared to 73% for mathematics and 77% for reading and language arts. We utilized a pre-post survey strategy to investigate the impact of a STEM immersion study abroad program on PSTs' culturally responsive teaching and STEM teaching efficacy and attitudes. Our study was given exempt status through our Institutional Review board, HUM#00236472.

This pilot study allows us to look deeper at the impact of a short-term study abroad program on PSTs' beliefs that engaging in culturally responsive teaching practices will have positive classroom and student outcomes. The opening line of our department mission statement is: "a commitment to advancing our local and global communities." Our research is the first step in setting the stage for future research to ultimately help us obtain the goals of the education department mission.

We selected two survey instruments to assess any changes in our students' culturally responsive teaching and STEM teaching efficacy and beliefs: the Culturally Responsive Teaching Self Efficacy Survey (CRTSE) and the Teacher Efficacy and Attitudes Towards STEM Survey (MISO T-STEM). Data analysis of the pre-post surveys provide insight into changes in teaching behavior that may impact culturally responsive and STEM teaching practices in PSTs' future classrooms. Additionally, any changes in teacher's confidence and self-efficacy in both areas supports the desired outcomes of our educator preparation program.

There were two survey administrations: the pre-survey was completed one month before leaving and the post-survey was completed ten days after students returned. The pre-post surveys were conducted in our campus lab by our department field coordinator to maintain student anonymity with the researchers. They were assigned random numbers to match up pre and post surveys. This data was maintained on the field coordinator's Google Drive so that researchers could not have access to the student identities. Moreover, we wanted to be sure that students did not feel pressure to participate as their instructors would not know who participated and who declined. This procedure ensured that students know their privacy is important and that their grades would not be impacted. All students received a \$10 Amazon gift card at the conclusion of the survey, regardless of their consent decision. All survey documents and data are secured in our Qualtrics cloud and Google Drive, both of which have duo enabled security and comply with all sensitive data policies.

3.3 Participants

The data for this study were drawn from a population of PSTs enrolled in an elementary teacher education program in a Midwest university. Subject recruitment was a convenience sampling from students registered for a faculty-led study abroad trip to a university in the Netherlands. There were 12 students on the trip and all of them were invited to participate in the study; all 12 chose to participate. Of the total sample (n = 12), 100% were white females. The sample consisted of 1 (8.3%) senior, 5 (41.7%) juniors, and 6 (50%) sophomores.

3.4 Program Description

The *Netherlands: International K-8 Mathematics & Science (STEM) Teaching & Learning* program was a two-week-long, faculty-led study abroad experience designed for PST education majors at a Midwest university, in conjunction with a university in the Netherlands. The program was supported by the university's *Center for Global Engagement*, who assisted with pre-departure support in addition to grants awarded to the PSTs to help offset a significant portion of the financial burden. In order to improve PSTs' sense of their ability to teach, the short-term study abroad program with a STEM emphasis immersed them in Dutch culture.

The program contained two main components: The first week was a culturally immersive experience with excursions centered around STEM connections and Dutch cultural history. The second week was a university STEM learning experience that included participants from 25 different countries and led by Dutch university faculty. Students lived in the university dorms alongside other international students enrolled in summer coursework.

3.4.1 Week 1: Cultural immersion with a STEM focus

The first week of the study abroad program was designed to immerse the students and the faculty into Dutch culture, while also participating in many STEM focused activities. The first few days consisted of excursions to the Anne Frank Haus, the Van Gogh and Rijks museums, and a canal tour of Amsterdam. The group also explored the NEMO Science Museum which has the goal of making scientific research accessible to all through interactive science exhibits. One of the pinnacle moments of the first week was touring the Leiden Observatory at Leiden University. Established in 1633, the observatory has been home to many famous scientists over the centuries, even the likes of Albert Einstein.

3.4.2 Week 2: University STEM courses in a culturally immersive context

During the second week of the study abroad program, the PSTs participated in the Netherlands university's summer school program. The focus of the STEM Education summer school was to bring participants up to date in research-based teaching practices in the field of the STEM subjects to deepen their knowledge of meaningful and relevant educational practices. The subjects covered the influence of technology on STEM education, cultural diversity and inclusion, connections to sustainable development goals (SDGs), and inquiry-based learning and interdisciplinarity.

The summer school STEM education program was a blend of lectures, seminars, workshops on educational research and

development in the fields of primary, secondary, and higher education. The PSTs were immersed in learning alongside thirty-five in-service teachers, faculty, and doctoral students from over 25 countries such as Turkey, Sweden, Malta, Greece, Cyprus, Indonesia, Norway, Spain, and Ghana, making it a culturally rich, STEM education experience.

3.5 Measures

3.5.1 Culturally Responsive Teaching Self-Efficacy Scale

The Culturally Responsive Teaching Self-Efficacy Scale (CRTSE) (Siwatu, 2007) was used to garner information from the PSTs’ self-efficacy beliefs in their ability to perform teaching tasks related to culturally responsive teaching practices. The 40-item scale asks participants to rate their perceived confidence in their ability to engage in culturally responsive teaching activities. They respond to statements such as, “I am able to identify the diverse needs of my students” by scoring themselves on a scale of 0 (not confident at all) to 100 (completely confident). A CRTSE strength index is produced by summing all scores and dividing by the total number of items. The strength index is a quantitative indicator of the strength of each PST’s CRTSE beliefs. Siwatu (2007) calculated the internal reliability of the 40-item CRTSE to be .96, making it a valid tool for this study.

More recently, Young & Young (2021) performed a systematic review of research articles that used the CRTSE with PSTs to establish confidence intervals. The researchers’ goals were to estimate normative scores for PSTs by calculating mean point estimates of strength indices across a range of studies to establish a 95% confidence interval for the CRTSE scale. They found that 95% of the mean scores fell between 70-83%. That said, teacher educators might expect the average PST to be 70-83% certain in the ability to implement culturally responsive teaching practices. One advantage of knowing this range can inform researchers on where their own subjects are in comparison. PSTs who fall well-below the 70% may require more extensive guidance to increase their own self-efficacy. This study will discuss the pre and post scores of its participants in relation to the confidence intervals in the Findings section.

3.5.2 MISO Teacher Efficacy and Attitudes Toward STEM (T-STEM) Survey

The MISO T-STEM survey was developed by the Friday Institute for Educational Innovation in 2012. There is validity and reliability data to support the strength of the instrument when surveying elementary PSTs. Some questions from the teaching efficacy and beliefs along with the teaching outcome expectancy beliefs were derived from the STEBI instrument. We did not use the student technology use, teacher leadership attitudes, or the STEM instruction sections as they were geared towards PSTs during their student teaching and practicing teachers. We looked at the items connected to outcome expectancies, STEM efficacy, 21st Century Learning Attitudes and STEM careers as these were the focus of our research questions. Permission to adapt the instrument is given on the survey cover page. The questions for the content specific areas are identical but separated into Science and Mathematics categories. This allows the data to show if there

are any differences between PST subject area efficacies. The survey is a five-point Likert scale in range from Strongly Disagree to Strongly Agree with Neither Agree or Disagree in the middle. The challenge with looking at impact using this tool comes when respondents already have strong outcome expectancies or efficacy in the areas being assessed and therefore little room for growth or impact from an experiential learning event. Even with this limitation the T-STEM instrument is a valuable tool aligned with our project. For purposes of data analysis, we assigned points to each option with a one for Strongly Disagree up to a five for Strongly Agree to obtain numerical data. This was a common strategy utilized in the literature.

3.6 Study Data

Our pilot study was centered around two PST efficacy survey instruments: CRTSE, a 100-point continuum, and the MISO T-STEM, a five-point Likert scale. The Netherlands university summer school program had a STEM focus, so this allowed us to look at the impact of the study abroad trip in both STEM teaching and culturally responsive teaching self-efficacy.

3.6.1 Quantitative Results

TABLE 1: Pre-Post Survey Results Quantitative Data Table (analysis from raw survey data)

	MISO- Science Outcome	MISO- Math Outcome	MISO- STEM Efficacy	MISO- STEM Careers	CRTSE
Questions (n)	9	9	17	4	40
P-Value	0.001785	0.00003167	0.005429	0.002995	0
Paired T-Test	4.5873	8.3636	3.2129	8.8968	24.169
Cohen’s D	1.53 (large)	2.79 (large)	0.78 (medium)	4.45 (large)	3.82 (large)
Mean Pre	3.5	3.5	4.7	2.6	76.21 (Falls within 95% CI)
Mean Post	3.9	4.0	4.8	3.8	89.83
Avg of Differences	0.3667	0.5111	0.1176	1.225	13.6107
Std Dev	0.2398	0.1833	0.151	0.2754	3.5617

Young and Young (2021) state that a systematic review of studies utilizing the same survey instrument, CRTSE, shows that the strength index for culturally responsive self-efficacy of elementary majors fell between 73-81 on a one-hundred-point scale. Based on our pre-survey results, our PST participants fell within this same average range with a strength index of 76 points. The post survey results indicate a significant increase in overall cultural competencies with an average group gain of over ten points, from 76 to 89 points. This resulted in a large Cohen’s D effect size of 3.82. Within those gains, item analysis from the pre/post survey found four items that had group gains of 15 points or more: praise English language learners for their accomplishments using a phrase in their native language (+20.5), revise instructional material to include a better representation of cultural groups (+20.17), design a lesson that shows how other cultural groups have

made use of mathematics (+17.5), and greet English language learners with a phrase in their native language (+15.83).

The MISO T-STEM efficacy score showed the lowest strength factor, 0.78 medium. The other areas of the MISO T-STEM survey all showed a large impact factor. The STEM careers area had the largest Cohen’s D with 4.45 effect size. This was followed by Mathematics Outcomes, with a 2.79 large effect size and the Science Outcomes with a 1.53, large effect size. Further item analysis within the MISO T-STEM pre-post survey shows the specific areas of PSTs’ gains. PSTs showed the largest gains in the STEM careers categories: where to direct students to find information about STEM careers (+1.5), where to go to learn more about STEM careers (+1.4), where to find resources for teaching students about STEM Careers (+1.1), and knowledge about current STEM careers (+1.0). The largest item gains for science and mathematics teaching are highlighted in table 2, below:

TABLE 2: MISO T-STEM Survey Items (Friday Institute for Educational Innovation, 2012) with Greatest Pre/Post Analysis Gains on a Five-Point Likert Scale

Science	
The teacher is generally responsible for students’ learning in science.	+0.6
If parents comment that their child is showing more interest in science at school, it is probably due to the performance of the child’s teacher.	+0.6
Students’ learning in science is directly related to their teacher’s effectiveness in science teaching.	+0.7
Mathematics	
When a student does better than usual in mathematics, it is often because the teacher exerted a little extra effort.	+0.7
The teacher is generally responsible for students’ learning in mathematics.	+0.7
If students’ learning in mathematics is less than expected, it is most likely due to ineffective mathematics teaching.	+0.8

3.6.2 Student anecdotes from post survey

It is important to have both numerical descriptors and narrative responses so that we minimize assumptions about PSTs’ ideas. The anecdotes articulate specific impacts of the study abroad experience on our PSTs and provide additional insight into the quantitative numbers. The following quotes are from PST responses on open ended survey question about the impact of the trip on their future teaching experiences.

Student 1: “In every seminar that we took at [Netherlands University] we always worked collaboratively to solve problems or to have discussions. This is something I will implement in my classroom for all subjects. I also will give students the freedom to explore a math concept or science experiment before giving them explicit instruction on what to do to gauge their prior knowledge and allow them to build their own knowledge first.”

Student 2: “To make it relevant to the students’ lives, and to make things hands-on and explorable by themselves or in groups.”

Student 3: “To push myself to put myself in my students[’] shoes and see if the way I’m teaching is effective and will make sense.”

Student 4: “I observed things that made me think about things differently and how I could utilize what I learned in my classroom. Taking the summer class for a week allowed me to learn not only from the professors, but also from individuals

from all around the world. I loved learning about the various educational systems and how they function. I was overjoyed to be able to express myself freely and not be judged for what I said.”

Student 5: “Making note that it is okay to not always get the correct answer, but in turn use those wrong answers to fix mistakes.”

Student 6: “Ask a lot of questions to get the kids thinking. Let them figure out the answers, don’t just tell them.”

IV. FINDINGS AND DISCUSSION

4.1 Research Question 1

In what ways does a short-term study abroad experience impact PSTs’ culturally responsive teaching efficacy?

With experiential learning we discussed how there is both a personal growth and collective growth aspect to participating in a study abroad program. The CRTSE survey instrument is a one-factor analysis utilizing an overall average score on a 100-point scale. As a collective group, the data shows that PSTs increased their CRTSE scores by 13 points on a 100-point scale, with a large Cohen’s D strength factor. The areas of largest growth for our students were: praise English language learners for their accomplishments using a phrase in their native language, revise instructional material to include a better representation of cultural groups, design a lesson that shows how other cultural groups have made use of mathematics, and greet English language learners with a phrase in their native language are directly aligned to our CAEP Accreditation standard 1. It requires that we prepare teacher candidates who can understand and provide equitable and inclusive learning experiences. We as a department are expected to provide those opportunities for our PSTs and embed that learning throughout their program. Situating our PSTs within the context of the Young & Young (2021) systematic review, where they determined the average range for PSTs to be between 70-83%, we see that they went from the middle of that range (76.21%) to above average (89.83%) from one study abroad experience. This shows our PSTs have an average foundation for culturally responsive teaching in our program, but they grew substantially by participating in this study abroad experience.

4.2 Research Question 2

How does a short-term study abroad experience impact PSTs’ STEM efficacy and attitude beliefs?

The MISO-STEM efficacy score showed the lowest strength factor, 0.78 medium. That area was connected to pedagogy and the pre-test showed that our PSTs already felt strongly about their knowledge in this area. On a five-point Likert scale there was relatively little room for growth, so low impact scores were anticipated. However, the qualitative anecdotes give evidence to their personal gains. They stated that they are more comfortable with allowing students to explore ideas before explicit instruction. They have a better understanding of what it means to connect instruction to students’ prior knowledge and to make real-world connections during STEM teaching. Students stated a new understanding of the role of questioning and mistakes during the learning

process. That growth is not reflected in the quantitative gains but is directly related to growth in STEM efficacy and attitude beliefs.

The other areas of the MISO-STEM survey all showed a large impact within the STEM careers area having the largest Cohen's D impact factor of 4.45. This area is likely the result of our PSTs being exposed to a diverse collective of plenary lectures throughout the STEM course. They heard from professors and field researchers about topics such as inclusive teaching classroom climate, teaching for content and competencies in the context of STEM, relevance for STEM in a global sense, and how "viral" pictures can be misleading to the realities of scientific issues such as climate change. This is important because participants will not only be able to make connections to diverse STEM jobs in the classroom but also how to think critically about how science is being discussed in the media. They now have examples of how to contextualize global citizenry through a STEM lens.

The impact around science teaching efficacy and attitudes shows shifts in how PSTs view their own responsibility in student learning. They see that having effective science teaching practices is in alignment with how students learn science and a sense that the teacher has responsibility for that learning. This is in the sense of being able to create meaningful experiences for their students rather than responsibility of being the knowledge holder.

The shifts in mathematics efficacy and attitudes are like the science areas discussed above but includes a greater sense of intentionality in teacher decision making. Students doing better in mathematics being connected to teacher effort is again in the sense of how the learning experiences are built. They feel an increased sense of responsibility that their instruction is reflected in student learning.

If we connect all the results back to the efficacy claims that teachers are going to teach what they are comfortable with, then we can see evidence that our PSTs are going to be more comfortable with equitable STEM teaching practices. They see their responsibility in creating learning experiences that are explorative and connected to students' lives and backgrounds. This shows that having a study abroad experience contextualized in a STEM setting can strengthen their efficacy and attitudes towards STEM teaching.

V. CONCLUSION

There is a need to increase evidence of the impacts of short-term study abroad experiences in the literature, particularly in elementary teacher education. This project provides a starting point to address the gap in the literature identified by Fisher et al. (2022). It is clear that a two-week study abroad experience can impact our PSTs' culturally responsive teaching practices and STEM efficacy and attitudes. We want to use this pilot study to advocate for additional study abroad opportunities throughout our program and establish a working model for global citizenry in teacher education. Our hope is this data can be the impetus for additional funding to remove financial barriers and have equitable access to travel opportunities for all our PSTs.

On behalf of all authors, the corresponding authors state that there is no conflict of interest.

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