

Exploring Gender Dynamics in Intercultural Competence Development through a Study Abroad Program

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Abstract

Background: In this fast-paced interconnected world, developing intercultural competence has become a critical skill for individuals to effectively navigate diverse cultural contexts. Study abroad programs have emerged as a popular and effective means of promoting intercultural competence development. However, while the overall benefits of study abroad programs have been well-documented, there is limited research on how gender may influence the development of intercultural competence within these programs.

Purpose: This study aims to investigate gender differences in the development of intercultural competence among pre-college students participating in a study abroad program offered by a large midwestern university. Metacognition, the awareness and understanding of one's own thought processes, is a crucial aspect of study abroad experiences as it enables students to actively reflect on their cultural encounters, challenges, and personal growth. By employing a metacognitive framework, this study seeks to uncover how male and female participants navigate their intercultural experiences, the strategies they employ, and the unique challenges they face.

Methods: Eleven pre-college students completed the Intercultural Development Inventory (IDI) test before and after their study abroad experience. They also maintained guided reflective journals throughout the program. A mixed-methods approach was employed, quantitatively measuring changes in IDI scores and qualitatively analyzing the reflective journals using a metacognitive framework focused on identifying what went well, challenges faced, and strategies to address these challenges, with an analysis performed for each gender separately.

Results: The results revealed an increase in IDI scores for both male and female participants. However, female students showed higher gains compared to their male counterparts. The mean IDI score for females increased from 88.00 to 106.00, while for males, it increased from 77.60 to 82.48. Qualitatively, male participants reported enhanced cultural awareness and adaptation, overcoming initial resistance through reflection and self-awareness strategies. They also highlighted challenges related to cultural misunderstandings and emotional expression, employing strategies like emotional regulation and perspective-taking. Female participants experienced substantial personal growth and increased confidence, actively challenging stereotypes and engaging deeply with the local culture. Their main challenges involved adapting to new physical environments and navigating cultural norms. Strategies used included reflection, stress management, and observation to effectively manage and learn from these situations.

Implications: This study highlights the potential of short-term study abroad programs in enhancing the intercultural competence of students. The gender differences observed suggest that such programs might be differentially effective across genders, potentially requiring tailored approaches to maximize their impact. These findings are crucial for curriculum designers and educators aiming to integrate intercultural competence into pre-college programs, thereby preparing students for the globalized workforce they will enter. This study highlights the need for ongoing research into tailored intercultural training that addresses specific needs and

challenges encountered by different genders. The insights gained from both quantitative scores and qualitative experiences provide an initial understanding of how cultural immersion impacts students, guiding future enhancements in study abroad initiatives.

Keywords: metacognition, study abroad, undergraduate, intercultural competence, global mindset, higher education, gender differences

1. Background

Intercultural competence is an increasingly prominent skill that needs to be taught by higher education institutions to foster global-mindedness in students [1], [2]. Intercultural competence refers to an individual's ability to communicate effectively and appropriately with people from different cultural backgrounds [3]. In higher education, students' intercultural development is now a necessary skill, whether they pursue global careers or not, because the scope of issues and work individuals encounter today has grown on a global scale [4], [5]. Research shows that with higher education institutes prioritizing internationalization, students gain increased knowledge and interest in international issues [6], further allowing them to develop their intercultural competence.

1.1. Value of Study Abroad Programs in Higher Education

In higher education institutions, study abroad programs have garnered popularity, especially amongst liberal arts programs, as a way to provide students with a global scope of knowledge and skills [7]. These programs can encourage individual improvement in language, interpersonal and social development, and in academics and professional work— the impact of which can last for 50 years [8]. Additionally, study abroad programs are an effective way to promote intercultural competence in higher education students. These programs can help enhance global-mindedness and intercultural competence [9]. Studies show that even short-term study abroad programs can positively impact students' intercultural competency [10]. Additionally, study abroad programs, when effectively supplemented with structured work and activity, show more gains in individuals' intercultural understanding.

1.2. Study Abroad Programs in STEM Disciplines

Even in STEM programs, study abroad programs can yield a lot of benefits for students, with qualitative research from students showing benefits in personal growth and global competence [7], [11], [12]. With STEM fields growing exponentially, the need for intercultural competence is increasingly important for students studying in these areas to excel at communication and global understanding in professional careers [13]. However, in STEM disciplines, there is a far more limited emphasis on intercultural competence or global understanding [14]. STEM fields have some of the slowest growth rates of study abroad programs and limited student participation, which research attributes to “strict curricula of STEM majors and a lack of integration of study abroad programs with STEM curricula,” [15]. Further, despite the benefits provided by study abroad programs, many STEM students hesitate to participate, considering study abroad programs a risk to their career goals [12]. Thus, to bridge this gap, research

suggests better integration of study abroad programs into curricula and faculty involvement to boost participation rates [15].

1.3. Role of Gender in Study Abroad Programs and Intercultural Competence

While the overall benefits of study abroad programs have been well-documented, there is limited research on how gender may influence the development of intercultural competence within these programs. Studies show that females are much more likely than their male counterparts to participate in study-abroad programs [16]. Additionally, over the duration of study abroad programs, females usually grow more with global understanding and competence than male students [17]. Other research indicates that when there are fewer “intercultural experiences”, females have higher intercultural competence levels, but when there are more experiences, male students also show growth in their intercultural competence. [18].

1.4. Metacognition and Study Abroad

Metacognition is crucial in intercultural training because it enhances the ability to adapt and perform effectively in new cultural settings. According to Earley and Peterson [19], most training programs focus too much on cognitive aspects and overlook metacognitive strategies, which are essential for transferring learning to real-world situations. Metacognitive strategies help individuals make connections between training and actual experiences, which is particularly important for employees on short-term international assignments and students in study abroad programs. A significant gap exists in the preparation of students for study abroad programs, where metacognitive strategies are often underemphasized. This gap is critical because students in short-term study abroad programs have limited time to adapt to new cultures and are expected to perform effectively within a brief period. Earley and Peterson argue that knowledge of other cultures is important, but the metacognitive and motivational components are most crucial for improving performance in multinational teams. Supporting this, Racicot’s study [20] found that motivational CQ positively predicts metacognitive CQ, which in turn influences the cultural experiences students engage in during their study abroad programs. These enriched experiences significantly increase their interest in future international work or study opportunities. Training in metacognitive strategies, such as guided reflection, can improve intercultural sensitivity and effectiveness, as supported by Pedersen [21]. The study found that students who received diversity training, which included guided reflection critical to metacognition, scored higher in intercultural sensitivity after their study abroad experience compared to those who did not receive such training. Therefore, incorporating metacognitive components into intercultural training can lead to better outcomes in global contexts and is essential for creating global citizenship.

Given the background on the significance of intercultural competence, the value of study abroad programs, and the roles of gender and metacognition in these contexts, this study aims to explore two critical research questions. By addressing these questions, we aim to understand the impacts of gender and metacognitive strategies on the development of intercultural competence through study abroad programs. This understanding will help in designing more effective programs and training methods to cultivate global-minded and culturally competent graduates.

RQ 1: How do pre-post IDI score changes, indicative of intercultural competence gains, differ between male and female students after studying abroad?

RQ 2: How do metacognitive factors influence intercultural competence development for male and female students during study abroad programs?

2. Conceptual Framework

Metacognition, broadly defined as “thinking about thinking,” plays a crucial role in learning and adaptation, particularly in novel environments such as those encountered during study abroad programs. This study integrates two key components of metacognition—metacognitive knowledge and metacognitive regulation—within the context of study abroad programs to understand how they contribute to intercultural competence.

Metacognitive knowledge refers to one’s understanding of cognitive processes, including knowledge about strategies for learning, understanding cultural differences, and reflecting on one’s thoughts and behaviors [22]. It encompasses three types of knowledge: 1) *Declarative knowledge* (awareness of one’s own cognitive abilities and factors influencing cognition), 2) *Procedural knowledge* (Understanding how to execute cognitive strategies), 3) *Conditional knowledge* (knowing when and why to apply specific strategies) [23]. This type of knowledge is crucial for students participating in study abroad programs as it enables them to be aware of their own cultural biases and learning processes. Being metacognitively aware will help them develop effective strategies for cultural adaptation and communication thus facilitating a deeper understanding and adaptation to new cultural environments.

Metacognitive regulation, on the other hand, involves the control aspects of metacognition. It includes activities that help students to gain control of their learning experiences, such as planning, monitoring, and evaluating their own learning [24]. These processes allow learners to actively manage their cognitive activities to ensure learning goals are met. In the context of study abroad programs, this can help students to actively plan their cultural engagements, monitor their interactions and emotional responses [25], and evaluate the effectiveness of their new interaction in navigating cultural challenges and adjusting as needed in the host country.

The interplay between metacognitive knowledge and regulation is crucial. As Veenman et al. [26] argue, effective learning requires both the awareness of one’s cognitive processes (knowledge) and the ability to control and adjust these processes (regulation). Therefore, combining metacognitive knowledge and metacognitive regulation forms an effective framework for understanding how students develop intercultural competence. Metacognitive knowledge provides the awareness necessary to recognize cultural differences and biases, while metacognitive regulation offers the tools to manage and adapt to these differences effectively. This combined framework can help students navigate cultural encounters, reflect on their experiences, and adjust their behaviors to enhance their intercultural competence.

3. Methods

3.1. Context and Participants

The participants of this study were 15 pre-college students enrolled in a short-term study abroad program. Of these, 10 students (6 male and 4 female) who completed their reflection assignments were selected for this study. The study abroad which took place over 10 days in Spain and

Germany, aimed to improve intercultural competence and metacognitive skills through immersive cultural experiences.

Operationalizing Metacognitive Knowledge

1. **Pre-Departure Training:** Before departure, students completed the first section of the reflection workbook that highlighted the importance of understanding one's cognitive processes and cultural biases. They also watched videos and self-reflected on their awareness of personal learning strategies. Students also completed the IDI to establish baseline measures of their intercultural competence.
2. **Cultural Debriefing by Mentors:** Mentors played an important role in helping students get accustomed to the norms of the host country. Mentors conducted debriefing sessions in the host countries to help students enhance metacognitive knowledge by providing insights into local customs, norms, and values. This knowledge aimed to equip students to better understand and appreciate the cultural context they entered.
3. **Reflection Activities:** Throughout the program, structured reflection activities, such as journaling and group discussions, were included to help students continually assess their cultural experiences, identify biases, and refine their learning strategies. Students were provided with a reflection booklet to document their experiences and reflections throughout the study abroad journey. These activities aimed to promote ongoing self-awareness and cultural understanding.

Operationalizing Metacognitive Regulation

1. **Planning Cultural Engagements:** Students were encouraged to set goals and plan their cultural engagements intentionally. This involved identifying opportunities to interact with locals, participate in cultural events, and explore different cultural settings.
2. **Monitoring Interactions:** During their stay students were taught to monitor their interactions and emotional responses. Techniques such as mindfulness, self-reflection, metacommunication, and platinum rule were taught to help students stay aware of their reactions and adjust their behaviors accordingly.
3. **Evaluating Outcomes:** Regular group debriefing sessions and individual feedback were incorporated to provide an opportunity for students to evaluate their experiences, discuss challenges, and share strategies that worked or didn't work. Students also engaged in guided self-reflection via journaling in reflection booklets throughout the experience. This evaluation process focused on helping students learn from their experiences and apply these lessons to future cultural interactions. Upon returning to the United States, students completed their final reflections in the booklet and took the post-assessment of the IDI to measure changes in their intercultural competence.

By operationalizing metacognitive knowledge and regulation within the study abroad context, the program aimed to facilitate a deeper and more adaptive intercultural competence among students. This approach was designed to not only enhance their ability to navigate and appreciate cultural differences but also foster personal growth and prepare them for global citizenship.

3.2. Data Collection

The Intercultural Development Inventory (IDI) is a widely recognized and validated tool designed to assess individuals' intercultural competence. Intercultural competence refers to the

ability to understand, communicate, and interact effectively with people across cultures. The IDI is grounded in the Developmental Model of Intercultural Sensitivity (DMIS), which outlines a continuum of stages progressing from ethnocentric to ethnorelative worldviews. The stages assessed by the IDI, along with their corresponding score ranges, are:

- Denial (55-70): Lack of awareness and engagement with cultural differences.
- Polarization (70-85): Viewing cultural differences in “us vs. them” terms, which may manifest as defense or reversal.
- Minimization (85-115): Recognizing cultural differences but focusing on commonalities, sometimes overlooking deeper cultural dynamics.
- Acceptance (115-130): Understanding and appreciating both similarities and differences across cultures.
- Adaptation (130-145): Developing the ability to shift perspectives and behaviors to adapt effectively across cultures.

The IDI has undergone extensive psychometric testing to establish its validity and reliability, making it a robust instrument for measuring movement along this developmental continuum. In this study, students’ IDI scores were used to determine their intercultural competence before and after participating in the program, identifying changes within the stages of intercultural development.

Pre-departure IDI was administered to students before their departure to capture their baseline intercultural competence and the **post-arrival IDI** was conducted upon the students’ return to measure changes in their intercultural competence. b) **Reflection Booklet**: Reflection is crucial in study abroad programs as it deepens intercultural understanding, enhances personal growth, and facilitates learning transfer. By critically analyzing their experiences, students develop greater self-awareness and adaptability, connecting their experiences abroad with academic and career goals. Reflection encourages critical thinking, emotional processing, and improved communication skills, enabling students to articulate and share their insights effectively. For this study, students were provided with a reflection booklet to document their experiences and reflections throughout their study abroad journey. This booklet guided students to reflect on various aspects of their intercultural experiences, challenges faced, and personal growth observed.

3.3. Data Analysis

The data collected was analyzed using a mixed-method approach, incorporating both quantitative and qualitative analysis techniques to provide a holistic understanding of the students’ intercultural development. Specifically, the goal was to understand the gender-wise differences in the experience therefore we conducted differential followed by comparative analysis by both male and female students.

Quantitative Data Analysis The pre- and post-IDI scores were analyzed using descriptive statistics. This analysis provided a detailed comparison of the students’ intercultural competence levels before and after the study abroad experience. Key metrics such as mean and standard deviations were calculated to highlight the overall improvements.

Qualitative Data Analysis The qualitative data from the reflection booklets were analyzed using a structured coding process. Initially, open coding was performed to identify distinct concepts and categories within the students' reflections. Following the open coding, axial coding was employed to examine relationships among the identified categories and to refine these into broader, more cohesive themes. This iterative process allowed for the emergence of significant themes that encapsulated the essence of the students' intercultural experiences and growth.

Ensuring Validity and Reliability To enhance the rigor of the study, we performed peer debriefing. The peer debriefing was conducted to validate the qualitative findings. During these sessions, peers with expertise in intercultural studies reviewed the coding process and the resulting themes, providing feedback and verification to enhance the credibility of the analysis [27], [28]. At least two rounds of peer debriefing were conducted. In the first round, the researcher received feedback from an expert, which was then used to refine and adjust the initial coding. This updated coding was subsequently reviewed in a second round of peer debriefing, further ensuring the accuracy and reliability of the final themes and enhancing the overall rigor of the qualitative analysis. Since we used both quantitative (IDI scores) and qualitative (reflection booklets) data sources allowed for triangulation, providing a more robust and holistic understanding of the students' intercultural development [29], [30].

3.4. Positionality

As researchers analyzing this study abroad program, it is important to acknowledge our positionality and relationship to the research. All three authors were external to the program implementation and data collection process, which offers both advantages and limitations to our analysis. Our position as external researchers provided a degree of objectivity in analyzing the data, as we were not directly involved in the program delivery or student interactions. This distance allowed us to examine the data without the potential bias that might come from personal relationships with the participants or investment in specific program outcomes.

However, this external position also means we did not have direct observational data or firsthand experience of the dynamics within the program. Our understanding of the student's experiences, challenges, and growth is mediated entirely through the collected data (IDI scores and reflection journals) and program documentation. We acknowledge that this limitation may impact our ability to fully contextualize certain aspects of the students' experiences or capture nuances that might have been apparent through direct observation.

Furthermore, our analysis is influenced by our own backgrounds and experiences in intercultural education and research. While we have attempted to maintain objectivity in our analysis, we acknowledge that our interpretations are inevitably shaped by our own cultural perspectives, academic training, and theoretical frameworks we bring to this research. This influence extends to our choice of analytical approaches, the themes we identified as significant, and our interpretations of student reflections.

4. Results

4.1. Quantitative Analysis

The results revealed an increase in IDI scores for both male (n=6) and female (n=4) participants, see Figure 1. However, female students demonstrated greater gains compared to their male counterparts. The mean IDI score for female students increased from 88 in the pre-test to 106 in the post-test, reflecting a meaningful increase (increase of 7 or more points on IDI is a meaningful increase) in the intercultural competence. In contrast, male students started with a mean score of 77.60 and showed a marginal increase to 82.48 in the post-test, indicating a smaller yet positive change.

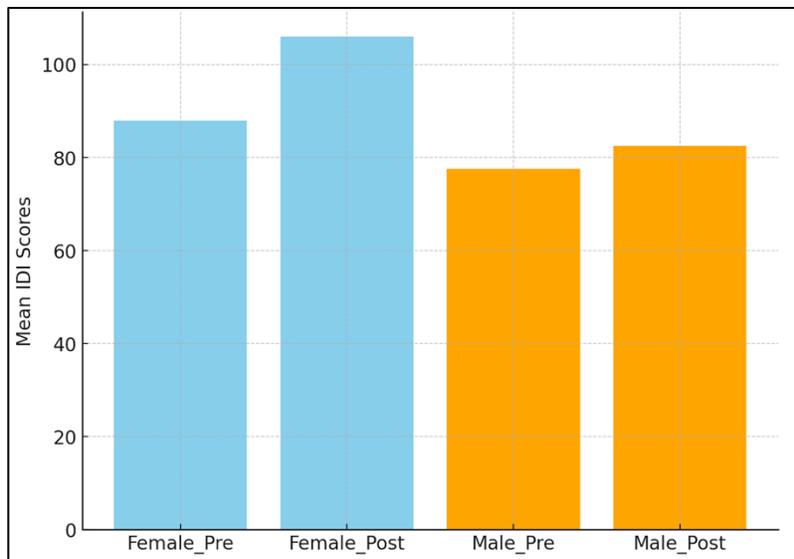


Figure 1: Pre-post IDI scores for female and male students

4.2. Qualitative Analysis

Male Theme 1: What Went Well

The study abroad program facilitated significant growth among male students by intertwining cultural awareness and appreciation, self-discovery, and confidence, and the process of moving from initial resistance to adaptation, all viewed through the lens of metacognitive knowledge and metacognitive regulation.

- *Initial Resistance and Adaptation:* Initially, many students experienced discomfort and resistance towards the unfamiliar cultural practices of the host country. This phase involved grappling with preconceived notions and feeling out of place in a new cultural environment. However, as they engaged more deeply with their surroundings, students began to adapt by utilizing metacognitive knowledge. They reflected on their experiences, recognizing their initial judgments and gradually shifting towards acceptance. One student shared, “My mindset definitely changed over time. I got more comfortable with my environment and realized that their way of doing things wasn’t wrong, it was just different.” This reflective practice shows the beginning of their cultural

adaptation, moving from judgment to acceptance and enhancing their intercultural competence.

- *Cultural Awareness and Appreciation:* Studying abroad helped the students to experience something new; as they were in the process of the new changes, they delved deeper into understanding the cultural behaviors and practices of the new country. They employed metacognitive regulation to move beyond surface-level observations and sought to understand the underlying values and norms. Another student noted, “I got to take a look at why the behaviors were different, allowing me to learn more about the values that make up the culture.” This deeper engagement, facilitated by active reflection and regulation of their cognitive processes, fostered a richer appreciation for the host culture, promoting empathy and reducing ethnocentrism.
- *Self-Discovery and Confidence:* Students began their journeys of self-discovery as they navigated the challenges of adaptation and cultural immersion. Metacognitive knowledge played a crucial role in enhancing their confidence and self-awareness as they confronted and overcame their initial resistance. They learned to navigate unfamiliar environments, communicate across cultural barriers, and reflect on their own identities in the context of a broader, more diverse world. For example, one student said, “I have learned that I have what it takes to go to a new country and not totally break down from stress of not knowing the language. I can do what I set out to do.” This experience not only enhanced their intercultural competence but also their personal growth, as they emerged more confident and self-assured. The process of managing their emotional responses and regulating their behavior in new contexts exemplified their development in metacognitive regulation.

Male Theme 2: Challenges Experienced

- *Cultural Misunderstandings and Adaptation:* One significant challenge was navigating everyday interactions, such as ordering food. For instance, a student recounted an experience in Germany: “The lady taking my order kept repeating the word ‘roll’ in German, and I had no idea what she meant.” This language barrier illustrates the difficulties in understanding and communicating in a different language, often leading to frustration and confusion. Another cultural adaptation issue involved differing norms around noise levels in public spaces. One student described an incident on a tram: “In Germany, I struggled with cultural differences regarding noise in public places. My friends and I were loud on the tram, enjoying ourselves as we would back home. However, the locals were visibly annoyed, expecting quietness in such settings. This cultural clash made it difficult for us to enjoy our time without feeling like we were disrupting others.” This situation highlights how cultural norms around acceptable behavior can vary significantly, requiring students to quickly learn and adjust to these differences to avoid conflicts and misunderstandings.
- *Initial Negative Judgments and Gradual Acceptance:* Many male students initially approached new locations with negative judgments, influenced by unfamiliarity and preconceived notions. One student shared, “Every time we arrived at a new location, I found myself negatively judging it... However, after a few hours or so in each city, I was having a blast.” This pattern of initial resistance followed by gradual acceptance and enjoyment shows the pattern of the adaptive process by the students. It highlights how

initial negative perceptions, such as discomfort and uncertainty can evolve into positive experiences as students become more comfortable and open to their new surroundings.

- *Personal and Cultural Differences in Emotional Expression:* Another challenge was dealing with differences in emotional expression. One student noted, “I often feel uncomfortable when interacting with people who express their emotions differently from what I am used to.” This discomfort points to the deeper cultural variations in how emotions are conveyed and perceived. Such differences can also lead to misunderstandings and discomfort, as students struggle to interpret and respond appropriately to emotional cues that differ from their own cultural norms.

Male Theme 3: Strategies to Overcome the Challenges

- *Reflection and Self-Awareness:* One of the key strategies was reflecting on their experiences to mitigate cultural misunderstandings. This involved utilizing metacognitive knowledge to step back and analyze cultural incidents, gaining valuable insights into their behavior and the cultural context of the host country. As one student noted, “I think that stepping back and reflecting on how a cultural incident happened is the best way to think about how a situation went down, what you did well, and what you could have done differently.” This reflective practice enabled students to learn from their experiences, identify areas for improvement, and develop more effective strategies for interacting in a culturally diverse environment. By employing metacognitive regulation, they could adjust their future behaviors based on these reflections, enhancing their cultural adaptability.
- *Emotional Regulation and Stress Management:* Managing emotions and stress was another crucial strategy, directly involving metacognitive regulation. The challenges of adapting to a new culture and environment often led to feelings of frustration and anxiety. One student shared, “It took some calming down to understand that everything would be ok, and I just had to focus on enjoying my time there.” Employing techniques to calm themselves and manage their stress helped the students maintain a positive outlook and focus on the meaningful aspects of their study abroad experience. This emotional regulation was essential for maintaining mental well-being and resilience in the face of challenges. By cultivating self-awareness, students were able to recognize their emotional states and use appropriate strategies to regulate them. This allowed them to engage more with their new environment.
- *Bridging and Perspective-Taking:* Male students also used bridging techniques to better understand and adapt to cultural differences, leveraging both metacognitive knowledge and regulation. Bridging involves making connections between one’s own culture and the host culture, finding common ground, and appreciating differences. One student explained, “I used the bridging techniques to better understand my friend... and look for ways to be supportive and empathetic.” This approach helped students view cultural differences through a lens of empathy and support, rather than judgment or resistance. By actively seeking to understand and bridge cultural gaps, students were able to build stronger, more positive relationships among themselves. Metacognitive regulation played a role in continually assessing and adjusting their perspectives and behaviors to foster these connections effectively.

Female Theme 1: What Went Well

Female students experienced personal and interpersonal growth during their study abroad program, primarily facilitated through meaningful interactions with locals and active engagement with the host culture. Similar to male students, this growth was explored through the lens of metacognitive knowledge and metacognitive regulation.

- *Positive Interactions with Locals:* Female students highlighted the positive interactions they had with local residents, which significantly enhanced their cultural immersion. One student mentioned, “In Spain, people seemed to be friendly... This allowed us to hold conversations with people and learn more about the cities.” These interactions provided students with authentic insights into the local culture, fostering a deeper understanding and appreciation of the host country. These experiences reflect metacognitive knowledge, as students utilized their understanding of social dynamics and communication strategies to engage effectively with locals.
- *Challenging Preconceptions and Stereotypes:* The immersive study abroad experience also allowed female students to actively challenge their preconceptions and stereotypes about the host culture. One student reflected, “From this experience, I learned to be more open to differences and look for the uniqueness in all cultures.” This openness to cultural differences and willingness to seek out the unique aspects of each culture helped the students develop a more inclusive and nuanced perspective. This process involved metacognitive regulation, as students monitored their thoughts, questioned their biases, and adjusted their perspectives to align with the new cultural realities they encountered. By confronting and overcoming their biases, they gained a richer and more accurate understanding of the world thus enhancing their intercultural competence.
- *Personal Growth and Increased Confidence:* The study abroad experience also catalyzed significant personal growth and boosted the confidence of students. For example, one student noted, “I learned that I am way more social than I thought... This trip sped up this process and I have more confidence in myself and my abilities now.” The challenges of navigating a new cultural environment coupled with the necessity of social interactions, helped students discover and develop their social skills. This newfound confidence was not limited to their ability to interact with others but extended to their overall self-perception and belief in their capabilities. Metacognitive knowledge played a key role here, as students reflected on their social interactions and used these reflections to enhance their self-awareness and social confidence. The accelerated personal growth experienced during the trip equipped the students with a stronger sense of self and increased confidence in their abilities to handle diverse situations.

Female Theme 2: Challenges Experienced

- *Adapting to Different Physical Environments:* One of the significant challenges faced by female students was adapting to the lack of air conditioning in Germany. As one student expressed, “I got irritated because no German establishments had air conditioning.” This discomfort with the physical environment depends on how accustomed students were to certain amenities and how their absence in the host country posed a significant adaptation challenge. Another environmental issue was the need to pay for public restrooms. A student remarked, “I am not used to paying for public bathrooms... This is a critical incident since I am used to being able to find a free public restroom near me in crowded areas.” This challenge highlights the practical difficulties and cultural differences that students have to navigate, which can significantly impact daily convenience and comfort.

- *Navigating Public Transportation and Directions:* Understanding and navigating public transportation systems in a foreign country posed another substantial challenge. One student shared an experience in Valencia: “In Valencia, when we arrived we started walking... but when my friends and I tried to go back later we got a little lost. I felt, at that moment, that the trains and buses were unreliable and confusing, but in the end, it was solved by my friends using their phones for directions.” This incident illustrates the difficulty of familiarizing oneself with new transportation routes and schedules, which can lead to confusion and anxiety, especially in the initial days of the study abroad program. The challenge of getting lost also reflects the broader struggle of orienting oneself in an unfamiliar city.
- *Cultural Norms and Social Behaviors:* Cultural norms and social behaviors, particularly around communication and ordering food, presented additional challenges. A student recounted an experience in Germany: “When we first got to Germany, we went to a market. The people taking orders for lunch spoke very quickly and my friend and I ended up not getting what we wanted.” This highlights the difficulties in understanding and adapting to different communication styles, which can lead to frustration and misunderstandings. Rapid speech and unfamiliar accents can make even simple tasks like ordering food challenging, requiring students to quickly adapt and develop new communication strategies.

Female Theme 3: Strategies to Overcome the Challenges

- *Adapting to Different Physical Environments:* Adapting to the lack of familiar amenities, such as air conditioning and free public restrooms, posed a significant challenge. Female students managed their emotions and frustrations by employing metacognitive knowledge, specifically reflection and self-awareness techniques. One student noted, “Stepping back and reframing to help in a critical situation could have aided the process by managing my emotions better.” By reflecting on their experiences and reframing their perspectives, students could better manage their emotional responses and reduce feelings of irritation and discomfort. This reflective practice allowed them to assess their emotional states and apply strategies to regulate their responses, demonstrating effective metacognitive regulation. This approach helped them maintain a positive outlook and adapt more effectively to the new physical environment.
- *Navigating Public Transportation and Directions:* Navigating unfamiliar public transportation systems was another challenge that female students faced. Coping skills and stress management techniques were essential in these situations, involving both metacognitive knowledge and regulation. One student shared, “There have been times, such as when I went on public transportation, when I was stressed and just needed a way to feel less stressed. I looked at pictures of my family and I and I felt a lot better.” By using familiar and comforting strategies, such as looking at family photos, students were able to reduce their stress levels and regain a sense of calm. Recognizing when they were stressed and knowing how to alleviate this stress reflects their metacognitive knowledge while applying these strategies demonstrates their metacognitive regulation.
- *Cultural Norms and Social Behaviors:* Understanding and adapting to new cultural norms and social behaviors required keen observation and a willingness to learn, utilizing both metacognitive knowledge and regulation. Female students found it helpful to observe and learn about the host culture’s norms to avoid unintentional breaches of etiquette. One

student remarked, “I kept in mind that this is not my culture and that I am not used to everything going on. I found it more helpful to lay low and observe instead of breaking unspoken rules.” By adopting a more observant and respectful approach, students could better navigate social interactions and integrate more smoothly into the host culture. This strategy helped them build positive relationships and avoid any judgment, thereby enhancing their overall experience. The ability to monitor and adjust their behavior based on their observations showcases their metacognitive regulation.

5. Discussion

The goal of this study was to understand the development of intercultural competence among male and female pre-college STEM students. A mixed-methods design was used to collect and analyze the data. The results of the quantitative analysis revealed an increase in Intercultural Development Inventory (IDI) scores for both male (n=6) and female (n=4) participants following their study abroad program. However, the degree of improvement differed between genders, with female students demonstrating higher gains compared to male students. The mean IDI score for female students increased from 88.00 (lower minimization) in the pre-test to 106.00 (upper minimization) in the post-test, showing a meaningful growth in intercultural competence. In contrast, the mean IDI score for male students increased from 77.60 to 82.48 (pre-post scores in polarization), reflecting some improvement in intercultural competence. These findings suggest that while both groups benefitted from the study abroad experience, female students showed a greater degree of growth in their intercultural competence.

The results of the qualitative analysis revealed both male and female students showed growth in cultural awareness and appreciation, though their strategies differed. Male students initially showed resistance but eventually recognized and valued cultural differences through metacognitive knowledge. They reflected on their cultural interactions, identified biases, and adjusted behaviors accordingly. This reflective practice was crucial in overcoming initial resistance and fostering a deeper understanding of cultural behaviors and values. Although their experiences varied, those who effectively utilized reflection and self-awareness saw notable personal growth. On the other hand, female students showed more consistent and significant gains in interpersonal connections and cultural immersion. They engaged deeply with locals, frequently mentioning positive interactions that facilitated a deeper understanding of the host culture. Female students actively challenged stereotypes and preconceptions, employing metacognitive regulation to manage their emotional responses and adapt their behavior to fit the cultural context. This proactive approach on the part of female students led to an appreciation of cultural uniqueness and significantly enhanced their social confidence and self-assurance. By recognizing and reflecting on their emotional experiences, they discovered new aspects of their social capabilities through immersive experiences leading to personal growth.

The qualitative analysis also revealed themes related to the challenges that students faced and strategies they developed to overcome the challenges. Male students primarily struggled with cultural misunderstandings, initial negative judgments, and differences in emotional expression. These challenges reflect their Polarization stage in the IDI, where individuals tend to view cultural differences in “us versus them” terms, either defensively emphasizing the superiority of their own culture (Defense) or idealizing the other culture (Reversal). This stage suggests that

male students were processing cultural interactions through a comparative lens, which often led to stereotyping or difficulty in appreciating deeper cultural complexities. Their initial negative judgments and misunderstandings indicate that they had not yet moved beyond this ethnocentric worldview to a more balanced and inclusive perspective. The tendency to focus on cultural contrasts rather than integration may have limited their ability to engage deeply and adapt effectively to new cultural contexts, resulting in less consistent improvements in their intercultural competence compared to female students.

However, male students employed metacognitive strategies, such as reflecting on their experiences, to better understand their cultural interactions. This reflective practice allowed them to identify biases and preconceived notions, enhancing their metacognitive regulation by adjusting their behavior in future interactions. They also utilized emotional regulation and stress management techniques to manage their responses effectively, fostering empathy and supportive relationships, which are critical for progressing toward greater intercultural competence. Female students, on the other hand, started at the lower minimization stage but moved towards the upper end of minimization. They faced challenges related to adapting to different physical environments, navigating public transportation, and understanding cultural norms. They managed these challenges through metacognitive knowledge by recognizing and reflecting on their emotional responses to environmental discomforts. This self-awareness allowed them to reframe experiences positively. By employing metacognitive regulation, coping skills, and stress management techniques, they were able to maintain composure and navigate logistical challenges effectively. Moreover, female students adopted an observational approach to understanding cultural norms, which reflects their ability to regulate behavior based on cultural context. These strategies enabled female students to move from lower to upper minimization, indicating a deeper appreciation of cultural differences and a more integrated approach to cultural interactions.

6. Implications for Teaching and Learning

The findings from this study provide several important implications for teaching and learning, particularly in the context of study abroad programs aimed at enhancing intercultural competence.

Firstly, for STEM students and intercultural competence in general, the results emphasize the importance of integrating intercultural learning into traditional STEM curricula. STEM students can benefit from experiences that enhance their cultural awareness and interpersonal skills. For example, encouraging STEM students to participate in structured study abroad programs or culturally diverse projects can significantly enhance their global perspectives and intercultural understanding.

Secondly, developing approaches to address the different needs of both genders are crucial. The results of this study showed that female students benefitted greatly from immersive cultural interactions and managing their emotional responses, suggesting that programs should provide ample opportunities for such engagements and equip students with emotional regulation tools. Whereas for male students, who exhibited more varied outcomes, incorporating structured reflection activities and discussions to help them identify and overcome biases proved beneficial. Programs can be designed to include gender-specific support systems that address these differing

needs, ensuring that all students receive the guidance and resources necessary to maximize their intercultural competence.

Thirdly, the role of metacognitive knowledge and regulation in fostering intercultural competence is crucial. For example, teaching students to reflect on their experiences, recognizing their biases, and regulating their emotional responses can significantly enhance their intercultural competence. Integrating metacognitive strategies into the curriculum through workshops, reflection sessions, and ongoing support can help students develop these critical skills. Structured activities that promote reflection, such as journaling and group discussions, can help students process their experiences and apply their learning in meaningful ways.

Overall, the study suggests that by addressing these implications, educators and program coordinators can create more effective and supportive study-abroad programs. These programs should aim to enhance intercultural competence and personal growth for all students, regardless of gender, by blending cultural learning with technical education and tailoring support to gender-specific needs.

7. Conclusion

This study investigated gender differences in intercultural competence development through a study abroad program, utilizing both quantitative and qualitative methods to provide an understanding of students' experiences. The findings revealed notable differences in how male and female students developed and demonstrated intercultural competence during their study abroad experience.

The quantitative analysis showed that while both groups experienced improvements in their IDI scores, female students demonstrated more substantial and consistent gains, moving from lower minimization (88.00) to upper minimization (106.00). Male students, while also showing improvement, remained in the polarization range (77.60 to 82.48). These differences in outcomes suggest that gender may play a significant role in how students process and integrate intercultural experiences.

Both groups faced the universal challenges of adapting to new cultural contexts, but their specific difficulties and coping mechanisms varied, particularly in terms of metacognitive processes. Male students focused more on metacognitive knowledge through reflection and bridging techniques, which helped them understand and navigate cultural misunderstandings and initial judgments. Female students leveraged metacognitive regulation by employing stress management techniques and observational strategies to handle environmental and logistical challenges. These differences illustrate the importance of metacognitive skills in enhancing intercultural competence and personal development during study abroad experiences.

7.1. Limitations

Important limitations must be considered when interpreting the findings of this study. The small sample size of 10 students constrains the generalizability of our results, particularly for the quantitative analysis. While the mixed-methods approach provided rich insights, a larger participant pool would be necessary to draw more definitive conclusions about gender-based

differences in intercultural competence development. The short duration of the study abroad program (10 days) may also limit our understanding of how intercultural competence develops over time, as longer exposure to different cultural contexts might reveal different patterns or outcomes.

Additionally, the study did not account for socioeconomic factors or their potential influence on students' ability to participate and engage fully in the program. The program's cost and structure may have inadvertently limited its access to students from more privileged backgrounds who could afford the time and financial investment required for international travel. Moreover, some students might have needed to maintain part-time jobs or other responsibilities, making it difficult for them to participate in such programs regardless of their academic qualifications or interests.

All participants were from a single Midwestern university, potentially limiting the diversity of perspectives and experiences represented in the study. The research did not control for pre-existing differences in cultural exposure, language abilities, or previous international experience, which could significantly influence how students process and adapt to new cultural environments. The reliance on self-reported data through reflection journals may have introduced social desirability bias, where students might have reported what they thought was expected rather than their authentic experiences. Furthermore, the study did not account for varying levels of preparation and support that students might have received from their families or communities prior to the program, which could impact their readiness for international experiences.

7.2. Future Work

Future research directions should address these limitations and expand upon the current findings:

1. *Longitudinal Studies*: Conduct longer-term studies that track students' intercultural competence development over extended periods, including follow-up assessments months or years after the study abroad experience.
2. *Larger Scale Investigation*: Implement similar studies with larger sample sizes across multiple institutions to enhance generalizability and identify broader patterns in gender-based differences.
3. *Comparative Program Analysis*: Compare the effectiveness of different program structures and durations in developing intercultural competence across genders, including virtual exchange programs and hybrid models.
4. *Intersectional Approach*: Examine how other demographic factors (such as race, socioeconomic status, and prior international experience) intersect with gender to influence intercultural competence development.
5. *Metacognitive Interventions*: Develop and test specific metacognitive interventions tailored to address the different patterns observed in male and female students' adaptation processes.
6. *Mixed Methods Enhancement*: Incorporate additional data collection methods, such as peer observations or host family feedback, to provide more objective measures of intercultural competence development.
7. *Cultural Context Analysis*: Investigate how the specific cultural context of the host country influences gender-based differences in intercultural adaptation and learning.

These findings and recommendations contribute to our understanding of how gender influences intercultural competence development and can inform the design of more effective study abroad programs. By acknowledging and addressing these gender-based differences, educational institutions can better support all students in developing the intercultural competence necessary for success in our increasingly globalized world.

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