



Assessing learning processes rather than outcomes: using critical incidents to explore student learning abroad

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Abstract

There is an increasing emphasis on assessing student learning outcomes from study abroad experiences, but this assessment often focuses on a limited range of outcomes and assessment methods. We argue for shifting to assessing student learning *processes* in study abroad and present the critical incident technique as one approach to achieve this goal. We demonstrate this approach in interviews with 79 students across a range of global engineering programs, through which we identified 173 incidents which were analyzed to identify common themes. This analysis revealed that students described a wide range of experiences and outcomes from their time abroad. Students' experiences were messy and complex, making them challenging to understand through typical assessment approaches. Our findings emphasize the importance of using a range of assessment approaches and suggest that exploring students' learning processes in addition to learning outcomes could provide new insights to inform the design of study abroad programs.

Keywords Study abroad · Critical incidents · Assessment · Global education

As study abroad programs have become more common, there has been an increasing emphasis on assessing student learning outcomes from such experiences (Salisbury, 2015). This trend towards assessment led to insights about what students were and were not learning abroad (Vande Berg & Paige, 2012) and what types of experiences and interventions could support student learning (Lou & Bosley, 2012; Vande Berg et al., 2009). Despite this progress, several authors and researchers have expressed concerns about the limited range of learning outcomes and assessment methods that dominate research and practice in study abroad programs (Deardorff, 2015b; Salisbury, 2012, 2015; Streitwieser & Light, 2017; Wong, 2015). These voices have called for a more holistic approach to assessment in study abroad, which would explore rather than overlook differences in students' backgrounds, experiences, and learning processes. Global educators have many ideas about the types of experiences that help students develop specific learning outcomes, but it is often the unexpected and unplanned experiences in another culture that can be most significant (Rodman

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& Merrill, 2010). Thus, to develop meaningful study abroad programs, support students effectively through these experiences, and understand the learning that takes place, we need to expand our assessment practices in study abroad research and practice.

In this paper, we argue for focusing on student learning *processes* in study abroad (in addition to *outcomes*), and present the critical incident technique as one approach to achieve this goal. Using this method, we explored the following questions: (a) What experiences do students highlight as most significant to them during their time abroad? and (b) How do students make meaning of these experiences? We used “significant” as a broad term to allow students to choose what types of experiences and learning they thought were important. This approach looked beyond traditionally emphasized elements of global programs that program designers may have included on a formal itinerary or class plan and considered the variety of experiences students might have during their time abroad. We also avoided focusing on a pre-set, limited number of possible learning outcomes and captured the breadth of what can be learned while abroad as noted by student participants.

Our sample focused on engineering students, a population whose global experiences have not been explored extensively. Engineering students (along with other STEM and professional disciplines) represent a unique study population because their subjects of study may not connect as obviously with local culture—compared to, for example, language, music, or history. Nevertheless, engineering educators realize the importance of developing global competence for the increasingly globalized workforce (Jesiek et al., 2015). Identifying significant cultural experiences for engineering students abroad and the process they follow in interpreting these experiences provides useful insights to inform the design of global engineering programs.

Literature review

In this section, we present traditional approaches for assessing student learning abroad along with critiques of these approaches. We suggest that the complexity of students’ experiences abroad can be better understood with a focus on students’ learning processes.

Assessing learning outcomes in study abroad

The increasing emphasis on assessment and learning outcomes in higher education has been felt by global education professionals, whose offices need to be able to defend continued investment in their programs (Comp & Merritt, 2010). Students’ reflective reports that studying abroad “changed their life” are insufficient to make these arguments, so researchers have sought to understand more specific outcomes, such as *intercultural competence* (in various forms). The Intercultural Development Inventory (IDI) based on Bennett’s (1986) Developmental Model of Intercultural Sensitivity became the centerpiece of many research and assessment projects in global education (Hammer et al., 2003). For example, in the edited volume *Student Learning Abroad*, a majority of the programs and studies highlighted use the IDI as the primary form of assessment (e.g., Engle & Engle, 2012; Lou & Bosley, 2012). Salisbury (2015) attributes this focus on the IDI and similar instruments to institutional interest in assessing student competence development over the course of their time at university, with the additional benefit that it allows easier comparison across research studies and programs. Although many studies and programs incorporate

other assessment methods beyond the IDI, the goal of measuring intercultural competence remains central to assessment approaches in international education.

Several weaknesses have been identified in these typical assessment approaches. First, although many studies have claimed students learn from study abroad experiences, research in international education is plagued with methodological concerns including single-program studies, non-representative samples, and self-selection bias (Ogden, 2015; Twombly et al., 2012). Making causal claims about the impacts of a specific experience is challenging in this context. This challenge is exacerbated by the complex, messy experience of study abroad, which can have more variation in events and activities than traditional classrooms (Deardorff, 2015a) as well as variation in student participants, which is rarely accounted for in traditional pre/post studies (Niehaus & Nyunt, 2020). Several authors have argued that international education research and assessment needs to stop viewing study abroad experiences in a vacuum and take into account the inputs (student characteristics), experience (time abroad), and larger environment (college curriculum) to understand how study abroad can contribute to students' learning at university (Deardorff, 2015b; Niehaus & Nyunt, 2020; Salisbury, 2012, 2015). Even the originators of the IDI have suggested that "developmental interviews" are essential for interpreting what might lead to changes in IDI scores over time (Hammer, 2012).

Beyond methodological concerns, however, there is a larger question of whether learning outcomes assessment makes sense in international education. Wong (2015) argues that we limit understanding by focusing on a narrow set of outcomes and instruments, going as far as suggesting that intercultural competence development as conceptualized by educators and researchers may not be possible in education abroad (Wong, 2018). Streitwieser and Light (2017) maintain that the traditional models of intercultural competence paint a picture of international experiences "adjusting" students in a linear fashion until they achieve the desired competencies. They argue that this framing is not a realistic depiction of the "messiness" of encountering a new culture and instead suggest an alternative focus on students' conceptions of their experiences abroad. A similar argument focuses on the need to account for the psychological experience and emotion associated with studying abroad, which can be significant for students even if assessed learning outcomes show little change (Ward & Kennedy, 1993; Whalen, 1996; Zull, 2012). As argued by Alred and Byram (2002), an education abroad experience can act as a "reference point" that can continue influencing an individual over time (p. 351), so assessing student outcomes immediately following the experience may limit understanding of its potential impact (Wong, 2015; Zull, 2012). Together, these critiques suggest an alternative approach to assessment that focuses on the *process* of learning abroad rather than the immediate outcomes. Building on Deardorff's (2015b) recommendations for a new paradigm in assessment, our paper presents one approach for assessing learning processes.

Complexity in assessing student experiences abroad

Despite the overall focus on learning outcomes assessment in global education research and assessment, some researchers have taken a more nuanced approach and acknowledged the complexity in students' experiences abroad. For example, several studies have explored students' *meaning making* in global programs. One early example is Kiely's (2004, 2005) study of service learning in programs, which identifies six forms of transformation that students discussed after their time abroad. Kiely (2004) builds on Mezirow's (1997, 2000) transformation theory, which suggests that *disorienting dilemmas* can lead

to a process of perspective transformation. Jones et al. (2012) expand Kiely's model to apply to short-term immersion experiences and identify several types of experiences that are significant to transformative learning. Another study followed up with students one year after participation in a global program and found a divide between students who were continuing to be influenced by the study abroad experience and students who were not (Rowan-Kenyon & Niehaus, 2011). The influences of the experience abroad on different students were not identical nor aligned with a particular outcome, but students still reflected on the experience in meaningful ways. The best test of the success of the global program, the authors argue, is the transformative perspective change that students might experience, which may not be measurable using traditional methods (Mezirow, 1997, 2000). This conclusion is echoed in the work of Papatsiba (2005, 2006), who identified that the outcomes students demonstrated related to their adoption of either distant or relational proximity in describing their interactions with a new culture.

In these studies, a different idea emerges—experiences that create dissonance or are disorienting during the time abroad are often meaningful (Jones et al., 2012; Kiely, 2005; Rowan-Kenyon & Niehaus, 2011). This idea is one of the few concrete suggestions about the types of experiences that should be included in global programs and is supported elsewhere in the education abroad literature (Che et al., 2009). Although many studies have used student journals or reflective interviews to understand *outcomes* of global programs, fewer studies have focused on the *experiences* that students discuss or the *process* by which students make meaning of these experiences. Some studies have explored how student responses to cultural experiences shift over their time abroad, following their process of moving from “cultural bumps” to “personal triumphs” (Covert, 2014; Jackson, 2005, p. 179; Tian & Lowe, 2014). Others have asked students to list significant experiences on surveys and found that students listed different types of experiences, although often related to interacting with the local culture or taking field trips (Strange & Gibson, 2017; Vandermaas-Peeler et al., 2018). However, few of these studies have suggested that such approaches could be used to assess study abroad experiences beyond the context of a research study and often focus on assessing intercultural competence development as the primary outcome of interest.

Learning processes as an alternative approach to assessment

Building on these examples of research that have acknowledged and explored the complexity of students' experiences abroad, we argue that formal assessment of study abroad should focus more on learning processes rather than on learning outcomes. Assessment of learning outcomes is hampered because students have different backgrounds, spending time in another culture is complex and messy, and the impact of such an experience may not be immediately obvious and change over time. Assessing learning processes could explore topics such as the following:

- *Experiences*: Are students experiencing dissonance and/or experiences that challenge them at an appropriate level?
- *Support*: Do students have sufficient support to process these experiences?
- *Response*: Do students demonstrate thoughtful reflection? Are they processing their dissonance? What thinking processes do they demonstrate?

Although several prior studies explored these topics, they typically used open-ended data collection approaches, such as interviews or student reflections. These methods allow for rich insights but may result in an overwhelming amount of unstructured data for the average global education professional to process. We explored an assessment approach that provided more in-depth data than typically used self-report instruments while simultaneously being more structured than open-ended interview questions.

In this paper, we introduce the critical incident technique (CIT) as an assessment approach that can provide insights into students' significant experiences and allow a program leader, teacher, evaluator, or researcher to assess the learning process students follow in describing and interpreting a specific situation. CIT involves asking participants to describe an event of their choice in narrative form, including what happened, their response, and any outcomes associated with that incident (Douglas, et al., 2009), and responds to critiques in the global education literature that it is hard for students to explain what was impactful about their study abroad experiences (Wong, 2015). Rather than asking students to start by thinking about abstract concepts such as “what they learned” or “how they changed,” CIT asks for concrete experiences to serve as central anchors of the conversation. These experiences can be used to help students think about what they learned (Walther et al., 2011), and through this discussion, students' meaning making and learning processes become transparent. Critical incidents have frequently been used as an instructional technique in international education (Engelking, 2018; La Brack & Bathurst, 2012) but rarely analyzed for purposes of assessment. Through our findings, we aim to demonstrate how critical incidents can provide insights into students' experiences abroad and the learning processes they followed to make meaning of these experiences.

Methods

We used the critical incident technique (CIT) in interviews with students from different types of global engineering programs to explore the experiences they identified as significant while abroad and the meaning they made from these experiences. We asked students to: *Talk about two specific experiences that were significant to you during your time in [country name]. For these examples, I'd like you to think of a time where you felt that you learned something important (and this could be any kind of learning, about research, culture, travel, yourself, etc.).* Based on suggestions and examples in other CIT studies (Bott & Tourish, 2016; Hess et al., 2017; Walther et al., 2011), we prepared follow-up questions to encourage students to provide more detail as necessary.

Participants

We recruited participants from multiple types of global engineering programs including short-term study tours (24 participants), short-term class or projects abroad (9 participants), research/internships abroad (35 participants), and semester abroad (10 participants). This breadth of program types helped us understand a breadth of student experiences (called “maximum variation” sampling by Creswell [1998]). CIT studies in social science contexts have applied the concept of *saturation* to determine when a sufficient number of incidents has been collected (Bott & Tourish, 2016). Prior education-focused CIT studies found that 20–80 participants are sufficient depending on the context and research questions (Bott & Tourish, 2016; Hess et al., 2017; Nguyenvoges,

2015; Walther et al., 2011). We interviewed 79 students and asked for two critical incidents, following a structure from prior studies (Bott & Tourish, 2016; Nguyenvoges, 2015), which yielded 173 incidents across interviews to reach saturation (some students provided more than two). Table 1 describes the participant sample.

Data analysis

Several CIT studies have used multiple rounds of increasingly abstract coding, allowing for gradual interpretation which can enhance the reliability of the interpretation (Bott & Tourish, 2016; Walther et al., 2011). Based on these examples, we used three rounds of coding in our analysis of critical incidents, identification, topic, and concept coding (Saldaña, 2013), described in Table 2.

As in most qualitative research, this coding process was iterative, and the three rounds of coding overlapped and fed into each other (Saldaña, 2013). Our intent was to focus on student identified experiences and meaning making rather than introducing theoretical constructs during the analysis, similar to prior interpretive studies using the CIT approach (Bott & Tourish, 2016). As a result, many incidents had multiple codes in Round 2 to capture different aspects of the incidents, which were rarely identical and often had several pieces that combined to make the incident significant. Incidents could therefore fit into multiple themes in Round 3 based on the codes associated with them. During Round 3 coding, we sought input from other researchers by asking them to look at the Round 2 codes and identify themes. This process enhanced research quality and accounted for the familiarity of the researchers with some of the programs under study.

Table 1 Participant and program characteristics

Categories	Participants	Incidents
<i>Gender</i>		
Women	49%	51%
Men	51%	49%
<i>Prior travel experiences</i>		
None	20%	20%
Limited (1–2 trips)	25%	27%
Medium (3 + similar trips)	29%	28%
Significant (3 + different trips)	25%	25%
<i>Program length</i>		
Long (6 + weeks)	58%	57%
Short (5 weeks or less)	42%	43%
<i>Cultural distance of program location from the USA</i>		
Low (e.g., Australia, UK)	25%	25%
Med low (e.g., Italy, South Africa)	29%	28%
Med high (e.g., Japan, Spain)	23%	22%
High (e.g., China, Ghana)	24%	25%

Table 2 Coding strategy

Coding round	Coding method	Process description	Product
1	Identification	Review entire interview to identify critical incidents and separate text relevant to these stories into a separate document	A set of critical incidents
2	Topic	Identify codes to describe what happened in the incidents, including both external and internal events to the student	A list of descriptive codes
3	Concept	Group codes from Round 2 into conceptual themes. Multiple themes may apply to a single incident	A set of conceptual themes

Positionality statement

We approached this project through an interpretive lens with the intent of centering the experiences and meaning making processes of the students we interviewed. We designed the study with this goal in mind and have endeavored to present the results so as to emphasize students' interpretations of their experiences rather than our own. Both authors are from the USA but have lived and traveled abroad in personal and professional roles. We were closely associated with some of the educational programs from which we recruited participants, which may have resulted in our own ideas about what experiences were meaningful in those contexts. To reduce the influence of our personal experiences and professional roles on the findings, additional researchers reviewed the results and contributed their insights into the final coding process.

Limitations

Although we included participants from a variety of program types, a majority of participants attended one university. This limitation is partially addressed by incorporating research abroad participants from other institutions. A limitation with the CIT approach is that it asks participants to describe a situation in detail, which may be challenging after time has passed. One way that we sought to overcome this challenge was to send the CIT question in advance of the interview, which helped participants provide thoughtful answers and refer to photos and journals to assist their recall of events (Bott & Tourish, 2016). Furthermore, Bott and Tourish (2016) argue that when using CIT from an interpretive perspective, complete reporting accuracy is less important than the meaning that participants assign to incidents. Lastly, there were differences in the amount of time elapsed between participants' experiences abroad and when we interviewed them. These differences are important because students continue processing experiences abroad after they return in relation to continued experiences in their educational and professional paths. Thus, incidents that are significant to a student immediately after their return may not be the same as what would stand out a few months or years later. Although we did not observe notable differences in incidents based on this variable, it would be important to consider in using CIT as an assessment method.

Results

We identified thirty types of experiences in Coding Round 2 that mapped onto eight themes in Coding Round 3 (summarized in Table 3). Our results highlight the strength of using the CIT approach in assessing study abroad: we were able to gain a broad perspective on the types of experiences that students described and their processes for making meaning of these experiences. In the sections below, we provide examples from the main themes and describe how students discussed these experiences during their interviews. We allowed the student-generated learning processes to guide the analysis rather than a prior framework or instructor-driven itinerary.

Two of the themes occurred less frequently than the others: *research* and *iconic experiences*. The *research* theme identifies incidents in which students provided a story that was entirely focused on research and in no way related to the cultural aspects of their experience. Although these incidents provide insight on student learning, they do not connect to this paper's focus. Even less frequent was the *iconic experience* theme, which identifies incidents in which students found an event significant because they were at a famous location or simply because “they were there” at a specific place. This theme represents only one of the Round 2 codes which did not align with any of the themes identified in Round 3 because its significance did not relate to learning, culture, or personal growth.

Table 3 Summary of results from Coding Rounds 2 and 3

Round 3 theme	Corresponding codes from Round 2
Connecting with people	Connecting with a professor/leader Connecting with another traveler Connecting with a local professional Connecting with local people Developing a close set of friends
Personal growth or awareness	Feeling uncomfortable (culturally, scared, privilege) Having assumptions overturned (cultural) Personal growth or reflection Taking advantage of opportunities
Experiencing a foreign culture	Running into a cultural difference Working in a foreign culture Experiencing local way of life Experiencing foreign systems (e.g., education or healthcare) Gender related experience Experiencing non-touristy part of the country
Navigating a foreign country	Practicing a foreign language Communicating across a language barrier Dealing with unexpected situations Managing travel logistics
Gaining knowledge or awareness	Learning about local history Learning about local current issues Gaining an outside Perspective on the US Connecting engineering to culture Learning about a foreign culture's approach to social issues Observing poverty
Being on your own	Being isolated in a foreign environment Navigating on your own Traveling by yourself Getting lost

Connecting with people The most frequent theme was *connecting with people*, which describes incidents in which interacting with others was important to their significance. In a majority of cases, participants talked about interacting with local people, including students, professors, shop owners, and taxi drivers. Over half of the participants had at least one incident within this theme. Types of connections ranged in duration and depth, depending on the time available in a program. Students on shorter programs tended to report on specific conversations that were meaningful, whereas students on longer programs talked about developing relationships with local people over time. For example, a Research program student said:

I was doing sports, so I just started doing sports where they were doing sports. I could get exercise and then eventually met some people, and they invited me to a bar-becue and then I met a whole bunch of other people. So, I think the more times anyone puts themselves in more communities, the more they'll grow. You make friends, you learn new things. It was really fun to have, you know, conversations with people from a different country where, you know, they have an outside perspective of our country.

This quote highlights the learning that participants often attributed to the experiences of connecting with locals. Many students emphasized learning about the local culture while simultaneously developing new perspectives on the USA. Some students also described gaining a new perspective on how much one can have in common with someone despite cultural differences:

It seemed like my world vision definitely grew larger. [...] It didn't seem like [country] was so far away. And it made me realize that other countries aren't so far away, and the people aren't so far away. [...] that's an area that I really grew in.

Overall, experiences in which students were able to *connect with people*, especially local people, were identified as significant by many of the participants in this study.

Personal growth or awareness A majority of participants highlighted incidents where they experienced *personal growth or awareness*. This theme describes situations where internal change was the primary event that the participant found significant rather than an external activity. Students described experiences in which they felt uncomfortable, had assumptions overturned, chose to take advantage of an opportunity, or learned something new about themselves. One Study Tour participant described the following:

I remember just being like, I can't believe she doesn't speak English. I was like what kind of airport is this that they can't even communicate with people? And then I kind of stepped back and I was like, well why would she, right? We're in a country surrounded by countries where English is not the predominantly spoken language. And then I was literally like [Name], you're in a different country. [...] Why are you expecting it to be America? Why are you expecting your presence here to change their thousands of years of history and culture and identity just to accommodate you visiting their country? [...] I just feel like the entire time I was there I just felt like my privilege and expectations and selfishness were constantly just being checked.

Other students experienced personal growth by learning about themselves, whether gaining confidence in their abilities to navigate while abroad or developing personal

opinions and preferences. One student, for example, described how she came to dislike traveling with other students who always wanted to see the next big thing. She ultimately realized that she preferred to pursue experiences where she could become embedded in the culture rather than experience “iconic” locations. Although topics and contexts where students experienced *personal growth and awareness* varied across incidents, all of these participants emphasized the personal change that occurred as a significant aspect of the story.

Experiencing a foreign culture The *experiencing a foreign culture* theme describes incidents where participants emphasized being immersed, embedded, or “truly” experiencing a part of the local culture. These experiences ranged from participating in a local festival or traditional activity to interacting with the local government or healthcare system. Many participants talked about getting away from the “touristy” parts of the country and felt they were experiencing the local way of life. In some cases, participants found themselves running into a cultural difference when they became more embedded in a culture. In interpreting these experiences, participants discussed not only learning about the culture of the country but also developing more comfort with being in a foreign environment and interest in future travel. Students also discussed developing empathy for international students and other visitors to the USA, including one Semester abroad student who said:

I appreciated what the international students have to go through 'cause I think it's very similar to what they have to go through. So, it makes me appreciate a lot about them. And people who immigrate from other countries and come to the U.S. for work or for school. I think that I respect them a lot more and I understand the struggles that they have to go through, just 'cause for a lot of people it's like they knew their country and they move here forever and they have to just adapt forever.

Incidents where participants found themselves *experiencing a foreign culture* were significant memories both because of what they learned from the experience and because these experiences often fulfilled the expectations and goals participants had for their time abroad.

Navigating a foreign country The *navigating a foreign country* theme describes experiences where participants were dealing with the *logistics* of traveling in a foreign country (compared to experiencing the *culture*, as described in the previous theme). These experiences included speaking a foreign language, communicating across a language barrier, managing travel logistics, and dealing with unexpected situations. Participants who shared incidents related to languages often discussed moving from initial discomfort with language to becoming more comfortable communicating across the language barrier, either within a specific conversation or over the course of the entire experience. Participants who managed their own travel logistics often had stories about problems, and these situations became significant incidents for them. One participant had several of these issues at once:

It was kind of late at night and it was dark and my taxi driver spoke no English. It was the first time that happened. So I gave him the address of the Airbnb that I had printed out and he took me there and it was ... there were drug dealers on the sidewalk, there were people on the stoop, there were no lights. It was in the middle of this very uncomfortable place. I was trying to communicate with him that [...] this has to be wrong. [...] We couldn't communicate with each other, so it was really frustrating, I'm getting emotional. We were driving around, we see this family of

three, two parents and I think their son was 10 and they spoke [language] and English. I remember feeling this overwhelming thankfulness.

In contrast to the previous theme, where participants emphasized learning about the local culture, participants made meaning of the incidents in the *navigating a foreign country* theme by discussing what they learned about themselves and about how to travel. Self-confidence, flexibility, autonomy, independence, and responsibility were all topics that students discussed in relation to these types of incidents. One Study Tour participant connected an experience of being lost in a large city with a group of students to engineering project work this way:

Some of the girls who were with us were blaming the guys for leaving us. And I didn't agree [...] I was like, 'Well, we made that decision to leave. And we got back.' I don't want the guys leaving us to be what I remember about that. I want to be like 'I did this.' It's not their fault we left. They went one way, we went another way. I don't want to have me blaming guys because that gives them the power of they're taking care of me. And I was like, 'No, I'm taking care of myself.' I got back and I definitely feel like that helps in engineering too because there's so many guys. I don't want a guy to lead my project. It really helped me to be like, 'No, no. I can do it.'

Many students concluded that they were proud of themselves for overcoming a difficult or intimidating situation on their own in a foreign country.

Gaining knowledge or awareness The incidents in the *gaining knowledge or awareness* theme represent experiences in which participants learned new information or became aware of differences across cultures. Participants talked about learning on a range of topics including local history, local current issues, or how engineering relates to culture. They also became aware of how different cultures approach social issues, received outside perspectives on the USA, and observed poverty in a closer setting than they had previously. Learning about local history or current events often caused participants to realize that their perspectives on the world had been influenced by the way events are portrayed in US education and news sources. One Research program participant noted:

One experience I had, which I thought was pretty significant was going to the Hiroshima Peace Memorial. That was a really, really powerful experience because going to U.S. schools, all I learned about the atomic bomb was the rationale behind it and the strategic decision behind it. And so it was really eye-opening to go to the museum and see the full aftermath that it caused and just walking through there with ... surrounded by Japanese people, many of whom were crying as they walked through, was extremely powerful. It made me question the rightness or the wrongness of it, based on how much long-term effect it's had.

This theme captures the few cases (outside the *research* theme) in which participants made connections between their cultural experience abroad and their interest in engineering. Connections to engineering tended to happen in cases where visits with universities or engineering companies were built into the program, but one participant who did a summer internship with a non-profit shared the following:

I was mainly surveying because this was the initial site analysis and I actually got to use surveying that I had learned from civil engineering [...] But then using it in [country] was probably the most fulfilling experience. I got to explain to almost

the entire community, who came out to see what the heck we were doing with a total station instrument and a prism rod with a laser. And I became very good at explaining all of that in Spanish, which is exciting. [...] It was really exciting to have been able to use that and have every experience kind of build off each other. And then finally this summer I could connect engineering, Spanish, service, and faith for me, and that was just an incredible experience.

Whereas the previous themes emphasized external experiences or personal growth, the *gaining knowledge or awareness* theme described cases in which participants interpreted their experiences based on their development of new perspectives in a more cognitive sense.

Being on your own This theme highlights that global programs often offer students one of their first chances to be separated from structured guidance and support and to be responsible for themselves. Several students discussed how going to college provided some freedom, but there was still significant support that made it feel easier. When abroad and alone in a foreign environment (whether for an afternoon or a semester), participants described a moment of awareness that their actions and experiences were now dependent on their own decisions. These incidents differ from the earlier theme *navigating in a foreign culture* because that theme focuses on the external negotiations with the environment, whereas this theme emphasizes internal experiences of being isolated and needing to step into a role of more responsibility. One Semester abroad participant noted:

Traveling by yourself is a really interesting experience because you have to rely on your courage to talk to people. It's very different because [...] normally, you're just a sheep following some sort of shepherd or whatever, whether it's like ... it doesn't have to be traveling, but a lot of times you just go with the flow. But when you travel to a foreign country by yourself, it can be a really eye-opening experience ... it's difficult.

Participants who were on longer programs discussed that the feeling of being on their own led them to realize that they needed to find a community in their new environment. In several cases, these students had been on shorter programs first and described this aspect of longer programs as a key difference between the two. One Semester abroad student who had previously engaged in a Study Tour said:

I really liked being in [country] because it was more like normal life. I went there and I had this mindset that I'm going to put down roots because this is where I'm going to live. This is my home for the next five months. I need to find a community. I need to find normal hobbies that I want to do. I need to find a church and I need to find a Bible study and I need to find my personal groove for what I want my life to be here. [...] I'd never had this experience of being completely removed from that and placed somewhere where I didn't know anyone.

Although less frequent than the earlier themes, the *being on your own* theme describes an experience that can be powerful for students. Participants who discussed this theme in their incidents pointed to learning about themselves in ways similar to the *navigating a foreign country* incidents, but with more connections to their future adult life.

Concluding discussion

Assessment and research of global programs often focus on a limited number of survey instruments and pre-defined learning outcomes to analyze student learning abroad (Streitwieser & Light, 2017; Wong, 2015). Our study addressed critiques of this approach by exploring student experiences in global engineering programs using critical incident-based interviews. Through interviews with 79 students, we identified 173 critical incidents which we grouped into six main themes: (1) connecting with people, (2) personal growth or awareness, (3) experiencing a foreign culture, (4) navigating a foreign country, (5) gaining knowledge or awareness, and (6) being on your own. A key take-away is that few of the incidents described by participants fell neatly into any of these themes but spanned them and interacted in different ways. As argued by Streitwieser and Light (2017), students' experiences abroad are "messy," which is rarely captured in the typical IDI or GPI studies of global programs but which became immediately clear when we asked students to tell stories about their experiences. This approach also provided insights into the processes by which students responded to and made meaning of their experiences abroad.

The experiences and learning outcomes we identified using the CIT approach align with findings in previous research of study abroad programs. For example, the experiences students described in our CIT interviews can be connected with elements of the Student Conceptions of International Education (SCIE) typology (Streitwieser & Light, 2017). The SCIE feature "Being in the Other Culture" connects to *gaining knowledge or awareness*, "Relating to the Other Culture" connects to *experiencing a foreign culture*, and "Changing in the Other Culture" connects to *personal growth and awareness*. However, our study goes beyond the SCIE model because we did not focus only on students' conceptions of their host cultures but rather on their experiences being abroad holistically. The process through which students made meaning of these incidents encompassed not only being/relating to/ changing in the host culture, but also being/relating to/ changing within themselves. This aspect of learning in study abroad programs has been highlighted in previous studies on student identity development (e.g., Dolby, 2004; Miller-Perrin & Thompson, 2010) and growth in self-confidence or tolerance while abroad (e.g., Black & Duhon, 2006; Dwyer, 2004). These studies have typically relied on either survey instruments or student reflective writing to understand this type of development, where the former provides no insight into student learning processes and the latter can provide too much detail with little structure.

The CIT approach gives insights into student learning *processes* and highlights a wide range of learning *outcomes* while also collecting a manageable amount of similarly structured data that can be analyzed in a reasonable amount of time. In our experience, the CIT approach helped students talk about their experiences in a meaningful way by asking them to tell a specific story rather than asking open-ended conceptual questions about their experiences. Although some students still struggled to cite specific examples, most students told at least one story, and some told several. We recommend use of CIT or related approaches (e.g., photo-elicitation) to help students move beyond vague statements about their experiences and communicate in a structured, concise way about their experiences and learning abroad. We chose to analyze the critical incidents we collected through an iterative coding process to gain an in-depth understanding of the type of data we had captured using this method. Based on this experience, we believe the data analysis process could be streamlined to make this method more practical for use in program assessment and evaluation. For example, rubrics could be developed that focus on the learning processes students

demonstrate in describing and making meaning of their critical incidents. Furthermore, although our study uses interviews to collect critical incidents, a similar approach could be used in written reflections or even surveys (e.g., Douglas et al., 2009). We plan to explore these possibilities through future work with the goal of developing a more holistic and developmental approach to assessing study abroad programs.

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Data availability The data is not available to share publicly.

Code availability Not applicable.

Declarations

Ethics approval This study was approved by the Virginia Tech Institutional Research Board (IRB).

Consent to participate All participants in this study provided consent via signed consent forms, per the requirements of the IRB.

Consent to publish The consent forms used in this study explicitly stated that the research would be published.

Conflict of interest The authors declare no competing interests.

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