

Factors Impacting the Development of Intercultural Competence in Engineering Students' Long-term Study Abroad

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Together with an interdisciplinary team of engineering and languages faculty (Megan M. Echevarría, Bing Mu, Vinka Oynadel-Craver, Iñaki Pérez-Ibáñez) Sigrid is the PI of a \$149,000 NEH Connections Implementation grant: "A New Model for Integrated Humanities and Engineering Education." (2023-2025). Sigrid received the DAAD Alumni Association's Excellence Award for Educational Exchange (2019) and the URI Administrative Excellence Award (2019). Under her leadership, the IEP was awarded NAFSA's Senator Paul Simon Spotlight prize for innovative campus internationalization (2011), and the Andrew Heiskell Award (2012) by the Institute for International Education.

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Background

The paper investigates factors determining the potential for engineering students' professional and personal growth, intercultural development, and transformational change after a year of studying and interning abroad in Europe and Asia. Participants were enrolled in the University of Rhode Island International Engineering Program. They double major in an engineering discipline and a second language and spend their senior year abroad studying and interning as a mandatory part of their program, then return to campus as part of their 5th and final year where they take capstone courses in their respective engineering disciplines and the highest sequence of second language, culture, and literature courses.

Research question 1: Which changes in students' intercultural development were measured by the IDI assessment?

Research question 2: Which individual factors impacted changes in professional, personal and life skills development during a year of studying and interning abroad?

Literature review

In previous influential scholarship, Byram [1], Deardorff [2] and Bennett [3] have outlined conceptual frameworks and, like VandeBerg [4] determined factors impacting intercultural competence development during study abroad. Kolb [5] further researched the value of experiential learning, and the process of transforming knowledge experience while Kiely [6] looked at the process of transformational learning during service-learning experiences. How best should one assess students' intercultural competence development during such sojourns abroad? Davis/Knight [7] have recommended to move away from just outcomes-based assessment and to focus more on the comparison of those outcomes with the actual student experience; they call for an "assessment of learning," e.g. through the analysis of critical incidents cases [8]. Paras et al [9] advocate for a mixed-method, quantitative and qualitative approach to fully comprehend what happens holistically during the immersion experience. The goal should be not just to collect objective data with validated psychometric instruments such as the IDI, but rather to obtain more nuanced insights into the students' study abroad experience and processing of their sojourns abroad through qualitative analysis of student reflections. Similarly, Cohen et al [10] argue that solely relying on quantitative assessment may not bring to light important nuances of the complex experience abroad. Likewise, Streitwieser and Light [11] call for placing emphasis on individual student perceptions and reflections. Most recently, Mu et al [12] have shown that important insights can be gained when zeroing in on individual student experiences and aligning it with the quantitative results since the resulting data can either confirm, enhance, or refute findings obtained through each method. Authors who used different instruments, such as the cultural intelligence CQ or expanded CQ which examines the impact of personality traits on cultural intelligence development in a quantitative way, also mentioned the need for "future research by mixed-method approaches" to complement their findings [13].

Following these recommendations, this study used a two-phase collection process:

Methods

For the quantitative part, the author and an IDI trained faculty member collected data as part of pre- and post- assessment through the Intercultural Development Index (IDI) instrument developed by Bennett [14]. Pre-study abroad data were collected from 42 students the week of March 22-26th, 2022 before the cohort went abroad in August, and the post study abroad data were collected the week of November 16-28th, 2023, three months upon the cohort's return from their year-long sojourns. 22 students took the post-IDI upon return to campus. The fact that not all students took the post-study abroad assessment can be explained as follows: Some in the original cohort had gone abroad in their 5th year instead of the usual 4th year and had graduated by Fall 2023. Others who had taken the pre-IDI decided not to go abroad at all, and again others had returned but chose not to participate in the post-IDI assessment.

Prior to the post-IDI assessment in November, during the week of October 23, 2023, we invited students to join small Re-Entry Focus Groups. 20 students attended. We interviewed four groups of 2-7 students each, as part of our qualitative data collection process. The groups were mixed deliberately, both with respect to their majors (which ranged from biomedical, chemical, civil, computer, electrical, mechanical, ocean engineering, computer science and physics) and regarding the destinations from which they had returned (France; Germany, Japan, and Spain). The questions asked by the facilitators, both trained IDI administrators, consisted of four parts: Warm-up, Feedback and Evaluation, Elaboration, and Reflection (see appendix 1).

Participants:

The University of Rhode Island students in this study all went abroad in their 4th or 5th year through the International Engineering Program (IEP) which offers a five-year dual bachelor's degree leading to a B.S. in an engineering discipline and a B.A. in a second language, with an integrated year of studying and interning abroad. The program is designed to prepare for the interconnected global workplace, and to foster technical, intercultural and proficiency skills in a second language. Students take both language, culture, and engineering courses in the foreign language during their semester of study at one of the university's technical partner universities in Asia or Europe; during the internship they are enrolled in a six-credit language course facilitated online by language faculty/program directors from their home campus. The 42 students who were part of the 2022-2023 cohort studied abroad in France (5), Germany (25), Japan (6) and Spain (6) in the Fall of 2023; out of those, 39 continued with six-month internships in the Spring and Fall of 2023 in France (5). Germany (24), Japan (6) and Spain (4).

Data analysis¹

Results of the Quantitative Analysis

¹ Thank you to Bing Mu who ordered the IDI for the students and participated in some of the Focus Group interviews; and thank you to Erwin Tschirner who conducted the statistical analysis of IDI scores.

Continuing an IRB approved long-term study about intercultural development during study abroad [IRB1819-164], we used one of the foremost validated psychometric instruments, the Intercultural Development Inventory (IDI) and distributed a 50-question survey to the 2022-2023 cohort before and after study abroad. Depending on students' degree of agreement with those items, the instrument places them into five stages of the Intercultural Development Continuum (IDC) with the first two signifying a mono-cultural mindset, the third a transitional phase and the last two an ethno-relativistic perspective. The IDI has been widely used in educational, workplace and non-profit organizations to assess a person's orientation towards cultural differences.

The Intercultural Development Inventory (IDI) survey was administered to 42 students (26 m, 16 f, 1 transwoman) before and 22 students (14 m, 7 f, 1 transwoman) after their sojourn abroad. In addition, all students completed a questionnaire. The IDI measures participants' sensitivity to cultural differences ranging from no awareness (denial) to judging (polarization), de-emphasizing (minimization), and deep comprehension (acceptance) of differences and, finally, to exhibiting an intercultural mindset (adaptation). Intercultural sensitivity is measured on a scale from 0 to 145 with the following cut points: below 70 = denial; 70 = polarization; 85 = minimization; 115 = acceptance; and 130 = adaptation. Table 1 shows how many students who received both IDI surveys exhibited a particular worldview category before and after their program abroad. (See Table 7 for all students at the beginning of the program).

Table 1
Worldview Categories Before and After Program Abroad

Category	2022	2023
Denial		2
Polarization	6	5
Minimization	15	14
Acceptance	1	1
Adaptation		
Total	22	22

Table 2 shows the descriptive statistics of the change in scores from 2022 to 2023 for all programs.

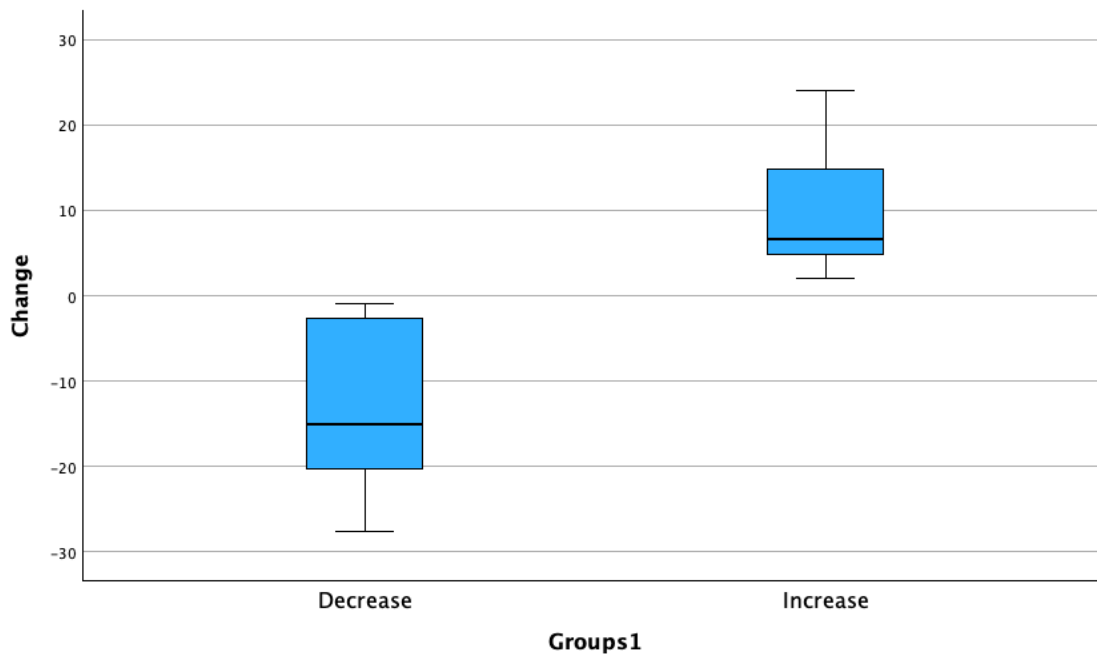
Table 2
Descriptive Statistics of the Change in Scores from 2022 to 2023

Program	N	Median	Mean	S.E.	SD	Min	Max
All	22	-1.63	-3.00	3.07	14.42	-28	24

Table 2 shows a great deal of variation with large S.E. and SD values and a large range. It also shows that more than half of the students scored lower in 2023 than in 2022. Therefore, the participants were divided in two groups: Group 1 consisting of students whose scores decreased

from 2022 to 2023 and Group 2 consisting of students whose scores increased from 2022 to 2023. Figure 1 shows boxplots of the two groups.

Figure 1
Boxplots of Students Whose Scores Decreased (Group 1) and Increased (Group 2) from 2022 to 2023



An independent-samples *t*-test (two-tailed) was run to determine if there were any significant differences between Groups 1 and 2. Because of the small number of both groups (see Tables 3 and 4), bootstrapping with 1000 samples was used. Equal variances were not assumed. The *t*-test showed a significant difference between the means of the two groups ($t = 6.02, p < 0.001, df = 19.54$), indicating that there were two distinctly different groups. The mean difference was 22.45 (95%CI: 15.22, 29.82,). The effect size was Cohen's $d = 2.50$ (95CI: 1.34, 3.62), which is a large effect size.

To examine if there was a significant score increase from pre- to post-program abroad, paired samples *t*-tests (two-tailed) were run. Bootstrapping using 1000 samples was used for robust results. Both *t*-tests showed a significant difference between the means of the two groups. While Group 1 showed a significant **decrease** ($t = -4.38, p = 0.001, df = 11$) with a mean difference of -13.15 (95%CI: -18.75, -7.51), Group 2 showed a significant **increase** ($t = 4.18, p = 0.002, df = 9$) with a mean difference of 9.24 (95%CI: 5.42, 13.50). Effect sizes were Cohen's $d = -2.66$ (95% CI: -2.02, -0.48) for Group 1 and Cohen's $d = 1.32$ (95% CI: 0.44, 2.17) for Group 2, which are both large effects. Tables 3 and 4 provide the descriptive statistics for each group.

Table 3
Descriptive Statistics of the Score Decrease from 2022 to 2023 for Group 1

Program	N	Median	Mean	S.E.	SD	Min	Max
All	12	-6.43	-13.20	2.95	10.22	-28	-1

Table 4
Descriptive Statistics of the Score Increase from 2022 to 2023 for Group 2

Program	N	Median	Mean	S.E.	SD	Min	Max
All	10	6.65	9.24	2.28	7.21	2	24

Tables 3 and 4 show a great deal of variation with large S.E. and SD values and large ranges for both groups. Therefore, the participants were subdivided into two additional groups each (a total of four groups): Group 1 consisting of students whose scores decreased from 2022 to 2023 by 7 or more points; Group 2 whose scores decreased between 1 and 6 points; Group 3 whose scores increased by 1 to 6 points; and Group 4 whose scores increased by 7 points or more. Figure 2 shows boxplots of the four groups.

Figure 2
Boxplots of Students Whose Scores Decreased by 7 Points or More (Group 1) and Between 1 and 6 Points (Group 2) as well as Scores that Increased by 1 to 6 Points (Group 3) and 7 Points or More (Group 4)

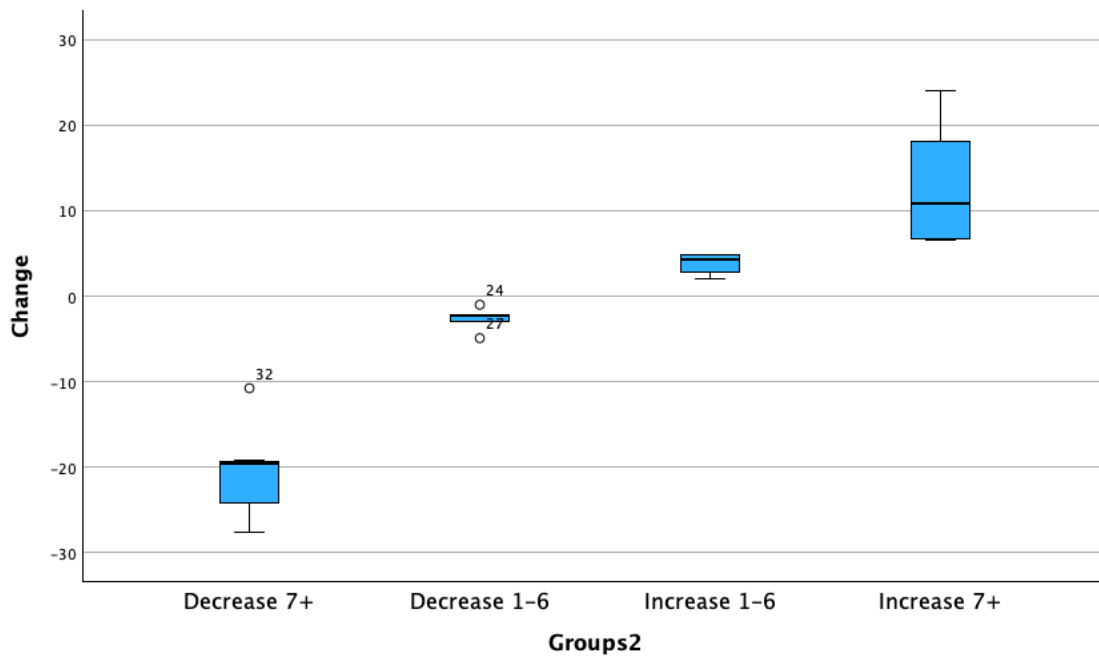


Table 5 provides the descriptive statistics for all four groups.

Table 5
Descriptive Statistics of Groups 1 to 4

Group	N	Median	Mean	S.E.	SD	Min	Max
1. Decrease 7+	7	-19.56	-20.71	2.16	5.71	-28	-11
2. Decrease 1-6	5	-2.33	-2.70	0.64	1.43	-5	-1
3. Increase 1-6	4	4.28	3.86	0.67	1.34	2	5
4. Increase 7+	6	10.81	12.83	2.99	7.36	7	24

A one-way ANOVA was run to determine if there were any significant differences between the four groups. Because of the small N of all four groups (see Table 5), bootstrapping with 1000 samples was used. Equal variances were not assumed. The ANOVA showed a significant difference between the means of the four groups: $F(3,18) = 48.76, p < 0.001$. The effect size was $\eta^2 = 0.89$ (95CI: 0.72, 0.92), which is a large effect size. The post-hoc Scheffé revealed three distinct groups: Decrease by 7+ ($M = -20.71$); Decrease by 1-6 **and** Increase by 1-6 ($M = -2.70$ and 3.86); and Increase by 1-6 **and** 7+ ($M = 3.86$ and 12.83), indicating that there were significant differences between Groups 1 and 2 and between 2 and 4 but not between Groups 2 and 3 or 3 and 4.

To examine if there were significant score increases from pre- to post-program abroad for all four groups, paired samples t -tests (two-tailed) were run. Bootstrapping using 1000 samples was used for robust results. Table 6 shows the results of the t -tests.

Table 6
 t -Tests Between Pre- and Post-Program Results for Four Groups

Group	t	df	p	M	95% CI	
					Lower	Upper
1	-9.618	6	0.005	-20.787	-25.065	-16.85
2	-3.388	4	0.073	-2.452	-3.878	-1.148
3	7.528	3	0.053	4.017	3.155	4.845
4	4.359	5	0.016	12.725	8.042	17.952

Table 6 demonstrates that the decrease in Group 1 from pre- to post-test and the increase in Group 4 were significant, while the decrease in Group 2 and the increase in Group 3 were not.

Table 7, finally, shows the worldview categories before the program abroad of the complete 2022 cohort ($N = 42$).

Table 7
Worldview Categories Before Program Abroad in 2022

Category	2022
Denial	1

Polarization	11
Minimization	29
Acceptance	1
Adaptation	
Total	42

Figure 3 shows the boxplot and Table 8 shows the descriptive statistics of the pre-program results.

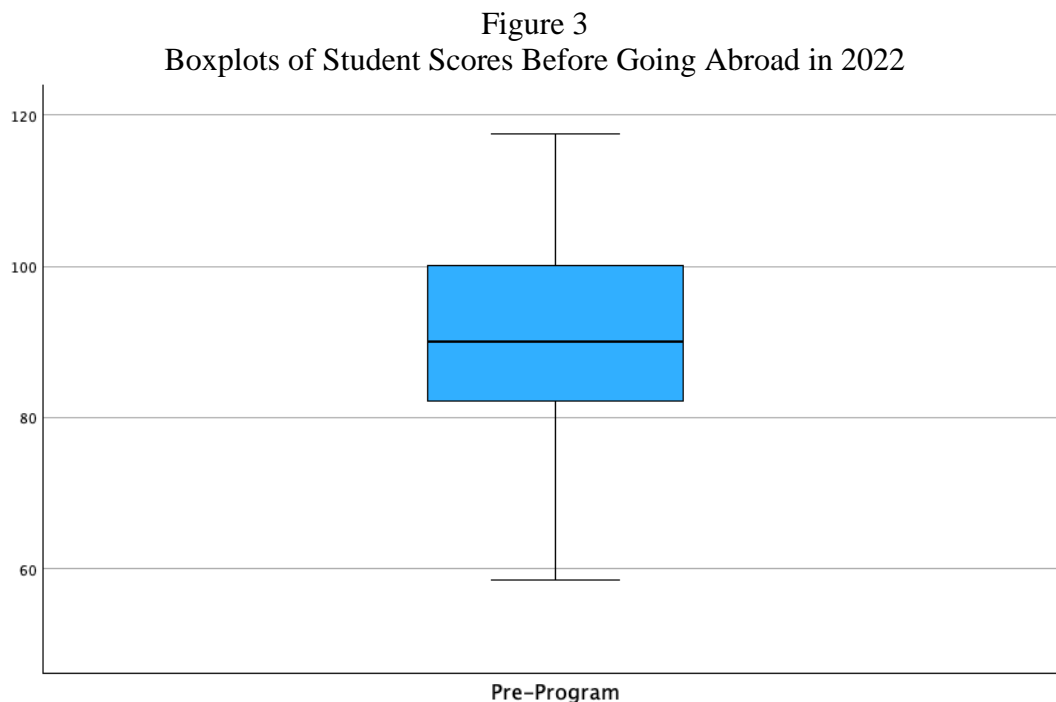


Table 8
Descriptive Statistics of the Pre-Abroad Scores of the 2022 Cohort

Cohort	N	Median	Mean	S.E.	SD	Min	Max
2022	42	90.07	91.43	1.99	12.87	59	117

Results of the Qualitative Analysis

The surprising results of the qualitative analysis above – that more than half of the students who took both the pre- and post-tests decreased in their scores, seven of them “significantly” as defined by the instrument, e.g. by a factor of +7 points – led us to seek answers in the qualitative analysis of student interview answers: Which factors led to a positive or negative change in the respective student’s developmental orientation over the time period of a year and eight months (March, 2022-November, 2023)? Would what we’d find confirm their placement on the IDC or refute them? Would it challenge the instrument’s ability to detect personal and professional changes and nuances of the study abroad experience?

A previous study which looked at individual experiences that affect students' development of intercultural competence in study abroad [12] determined thirteen individual factors which impacted students' intercultural growth either in a positive way (through 'cultural self-awareness', 'developing nuanced understanding', 'reflection' in the "cognitive dimension"; 'networking with the locals', 'target language use', 'forcing oneself out of the comfort zone', 'adapting to new sets of behaviors' in the "behavioral dimension" and 'emotional resilience', 'confidence', 'personal growth' in the "affective dimension," with the higher level themes as defined by Bennett [15]. Those that impacted growth in a negative way were 'judgmental mentality', 'lack of concrete action' and 'trauma'.

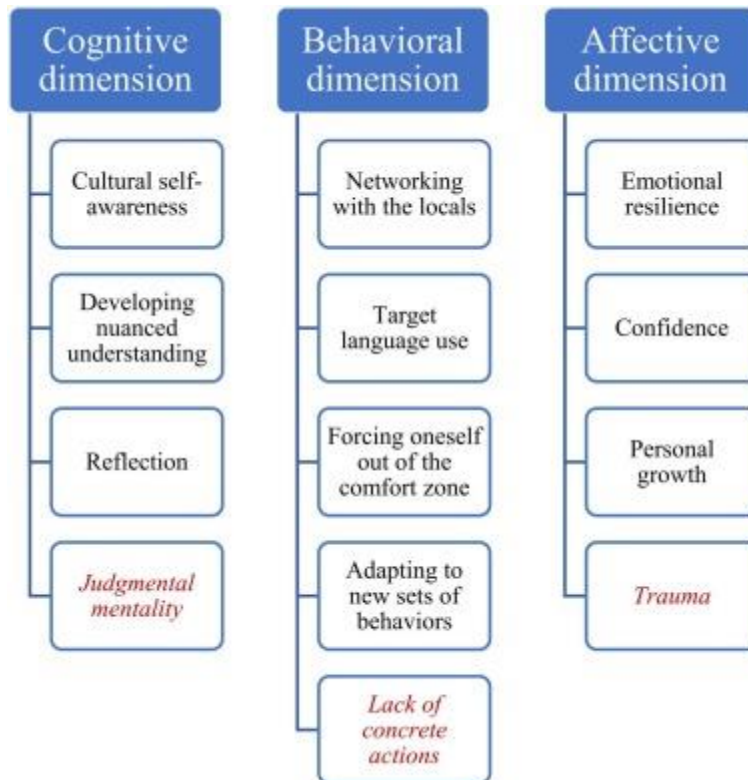


Fig. 1. The relationship between the 13 categories of individual experiences and the three higher levels of abstraction as per [12]

Aside from the categories listed above which this study's analysis confirms, we discovered two more categories in the "cognitive dimension", 'awareness of professional growth' and 'awareness of change in personality/identity'; one new category in the "behavioral dimension", 'developing life skills' with all correlating positively with intercultural development; and a new category in the "affective dimension", 'encountering extreme cultural difference', which was correlated negatively with intercultural growth.

Awareness of professional growth

Of the 42 students in the 2022-2023 cohort, 11 not only took courses in their second language and in their engineering discipline during the Fall semester of their study abroad but also availed themselves of the opportunity to complete credit bearing research projects in a technical institute at their various partner universities; 7 more chose a research project in a

university or private institute instead of an internship in a company for the second half of their year abroad. Doing research in a team was new for some. JD, for example, a student with a solid academic record of As, Bs, occasional Cs and a 104.85 IDI score prior to his abroad sojourn related finding himself, coming to terms with his engineering identity.

So, I like to tell people that when I went to Germany, I had no idea what I wanted to do as an engineer. Going through my one year in Germany I walked out of there knowing exactly what I want to do. [...] the biggest positive I got of going abroad was figuring out what I want to do as a career in my engineering field [...]. It was the research what, like, sparked it.

JD, originally reserved and not used to advocating for himself, then developed the confidence to ask his internship supervisor whether he could work on a project related to his newly found area of interest: "At Siemens, I asked my boss, if it was possible for me to do some hardware tests? And he's like, yeah. We got you!" Upon his return to campus, JD, who had admitted to being "completely confused, most of the time" in his classes prior to going to Germany, excelled in all of them with a straight A record and reported that they now "all made sense." He also joined a research group where he could "delve even deeper into integrated circuit design, the little chips you put on hardware."

A different example of growth was related to the student becoming aware of what she wanted to achieve professionally and in her future career, in this case graduate school. AC with a +6.87 post IDI score reports choosing "classes in which I learned what I needed to learn or wanted to learn, that would be applicable to my research, back at home or for graduate school." She chose a research internship in an institute and convinced her reluctant professor who argued "normally undergraduates don't take on research experiences because their only job is to be a student" by countering "Well, I can do it. I can do it. And I said, like, you can hire me full-time. I'm just really into it." She landed the internship as a fulltime research assistant without a stipend and could afford doing so since she had received a Gilman scholarship prior to departure.

Yet another outcome was a student, MO, who had doubts regarding her chosen field of civil engineering for a career path prior to her year abroad. Instead, she wanted to explore teaching. MO still chose a research internship during which she discovered her own strengths and confidence.

I feel more confident, especially being on my own. I feel like I really became independent and then also with the change in perspective, you know, it's one thing to read about different people or, you know, read about different perspectives but to go there and live in a different perspective for an entire year [...]

MO returned to campus determined and self-assured in her focus and began a graduate degree in Education. In her case, her +13.71 IDI score gain might also indicate having found herself professionally, albeit in a different way. As demonstrated in the examples described above, awareness in professional growth could range from transformational change in engineering identity (JD), confirmation of engineering identity (AC) to refuting an engineering identity (MO).

Awareness of change in personality/identity

A couple of students reflected on a new kind of self they had discovered abroad which they wanted to bring back home, nicely summarized by JD in this quote: “It's when I went to Germany, I didn't bring who I was in the US, but when I went back to the US, I wanted to keep who I was in Germany.” The transformational change others experienced had to do with discovering a healthier work-life balance, pace of life, and inner strength and perseverance in overcoming hurdles. MS with a +4.9 gain, a student who had been highly focused on her academics, and who pursued research before, during and after the year abroad, reports that after her year living in Germany, she was able to

walk up the hill now with no problem. I came back and I said, I'm gonna exercise every single day because I got used to walking. So, I came back feeling healthier in general. And kind of, like, I can just do anything because I could overcome anything, whether it was going to a doctor's appointment and not speaking the language well enough to express myself clearly or like, not having a place to stay.

A high performing student MN with a +2.61 gain and a job secured at General Electric even before entering her final 5th year back on campus expressed that returning to a “very fast paced” regimen after

working and then going home and having my free time not having homework during my internship [...] was a hard transition. The personality of wanting to travel and do things like, I feel, like, I now have to suppress it [...]. I still feel a disconnect to the person that I was. ‘Me’ in Europe or in Germany feels like that was a completely different person that went through all of that, and I'm working on kind of combining that person, that version of myself with right now and taking the parts of who I want to be [...]. I just very quickly adapted back to who I need to be at URI in the roles I need to fulfill here and did not get the chance to fully process that I grew in my year abroad.

While not expressed with such high self-awareness as MN displayed in the quote above, other students also commented on the significant challenges related to the transition from working abroad and a relaxed lifestyle to life back at school where every minute was planned out. MO commented: “So since I've been back it's kind of been like non-stop go.” The experience of having found and then losing again that new-found personality led several students in the focus group interviews to suggest a change in program design whereby International Engineering Program students would go abroad in their final 5th year to have the opportunity to transition from the internship directly into the workplace.

Others demonstrated high self-awareness related to their cultural identity like KK who was born in Ivory Coast, West Africa, had lived live in France before moving to the US and getting her citizenship. She had scored in Acceptance at 110.69 points before going to Japan and returning at almost the same level with a slight loss of 0.39 points. KK returned to the US fully aware that country-specific knowledge does not necessarily mean one can transfer all lessons learned to yet another very different culture. KK reports feeling “so much more flexible when it came to culture and all that” even before going abroad.

And now I went to Japan and we would have like rules and stuff [...]. So, just because I was living in, as kind of a foreigner in the US, I'm not already knowing everything about how it is to live in a different country since Japanese is so different, I guess. Yeah. I became like more open-minded and then definitely humbler about interior, controlling experiences.

MO similarly noticed experiencing "more culture shock when coming back" from "this Spanish lifestyle, which prioritizes a work life balance."

An interesting side observation is that while the above-mentioned transformational personality change accounts all came from female students, three male students, two with insignificant losses in their IDI post scores, and one who did not take the post assessment, perceived no change in identity, but rather confirmed their own sense of self. JM with a -2.41 post score added "I feel bad for saying this, but I didn't really have a personality change." And so did a male student, DB, with a -4.9 change in his developmental orientation "I haven't felt the biggest change. I'd say, um, what I've already said slightly more confident but overall, I feel more or less the same." Interestingly, SS related that he found himself "kind of doing the opposite where like the more I was exposed to the culture, the more I found that my own nationality was like flaring up. I felt very American by the end, and I did not try to hide that or try to become German. I found myself becoming like more American as the year, like, kept going." On the other hand, the same student reported how he felt so much more mature than his year-younger capstone teammates, and how he had changed with respect to the level of focus he could bring to his classes -- "I've submitted most of my assignments, like one or two days late." So he had, in fact, undergone a change but lacked the self-awareness to recognize it as such.

We might hypothesize that a higher level of processing and conceptualizing of experiences led to higher self-awareness while no or little reflection may have prevented some to even recognize that change had happened within themselves. The above examples demonstrate a range of perceived changes in personality: from positive change related to becoming a healthier person (MS), to challenges with losing the more relaxed version of oneself and ensuing loss of academic focus (SS) to change in cultural identity (KK) all the way to an all-encompassing transformational change in identity as experienced by MN who again, in a highly self-aware mode of reflection summarized what this change meant to her, " [...] the person that I left and the person I am now, is like completely different. So now I must learn how to live my life here as the person that I've become [...]. I find myself in a kind of weird headspace."

Developing life skills

Since the University of Rhode Island International Engineering Program's philosophy is to equip students with the linguistic, intercultural, and technical skills needed to hit the ground running abroad, it does not have a satellite campus in students' abroad destinations, nor does it use a provider with on-site support. Consequently, its cohorts are facing quite a few hurdles they have to overcome, first as a group in their small university cohorts, but later with each one on their own when transitioning to the internship phase in a new city. While these obstacles can be daunting, and can cause stress especially during the transition period, overcoming them requires development of a set of attitudes and supporting life skills which can either lead to further frustration or satisfaction.

Students used various strategies to cope and eventually overcome obstacles: one important strategy mentioned several times was “observing people.” SSa, who entered his year in France at polarization, and did not take the post test, advised,

people watching is the one [strategy] I used. before any like new interaction. I would at least wait for like 30 minutes to see how someone else did it, who looked more naturalized than I was and then I would do it and it worked every time [...]. Watching is so useful and then just mimicking it to the best of your ability gets you through 85 percent of situations and the other 15 you were going to fail, anyways, regardless.

“Being polite” was mentioned as another strategy, as per JM who remained in Minimization with a slight loss of -2.25: “Politeness. You'll meet some people that will by default just not like you if not hate you because you're from the United States. If you just kill them with kindness [...]. This ties in with kind of swallowing your pride at a certain point.”

“Insisting on using the target language” and “being flexible” proved good strategies as well. SSa: “[...] and I just continued to speak in French until I got responses in French.”. A further strategy mentioned by JM, was to “Hold your own ground. Just be patient. Like, you're gonna make mistakes. Take one step at a time, work through it and just take a deep breath. Like, that's so much of just keeping calm and pushing forward.” Others recounted “pushing themselves out of their comfort zone” deliberately to immerse as a best practice. KK: “I used to go to a community center at least once a week. So I'll talk to a lot of elderly people and then it's cool. So, I guess I really pushed myself and put myself over there and try it as much as I could.” Flexibility” was also often cited as by AS:

If something happened where I learned that my rent was too high, that I misread the contract, I tried not to freak out and cry and just calling it quits right away. I found other solutions. If a train is canceled, then like finding alternative routes that work -- that's flexibility.

Of crucial importance was immersion by “joining a local club” which afforded students to continue a comforting habit in times of stress. MN: “Playing rugby really, really helped because it helped me find a community.” In the case of KF, a student with a 23.39 gain, this gain might be contributed to her ability to – as she called it – taking hits and getting up again and again. KF:

Being open to taking hits, the number of Germans who would actively insult my German, when I would try to speak German to them were astronomical [...]. So I guess in the long term maybe trying to take life a little less seriously and being able to just say I'll make a lot of mistakes but with each mistake, in my coming back out at a faster rate than before, as what is what I would say the best strategy.

Encountering extreme cultural difference

When in their focus group interviews students were asked about whether they had encountered culture shock, many came up with examples regarding country-specific or regional differences they observed in their various destinations, but some reported experiencing culture shock due to encountering extreme differences. Here it is interesting to observe a regional difference: Students who had gone to European destinations, mentioned getting used to “public transportation

systems” (in France, Germany) coming from a driving culture; having to adapt to stores being closed on Sundays and pressure in supermarkets to pack their own food as well as different jaywalking regulations (Germany); or regional differences in language use between Paris and the South of France e.g. “pain au chocolat” versus “chocolatine”; needing to watch out for pick-pockets in the metro; a later meal schedule (2-4 p.m. lunch), and closed restaurants in Spain (4-8 p.m.) when dinner time starts, as well as fancier clothing style even for leisure. However, students who had gone to Japan – three of them with post study abroad IDI score showing regressions of -29.3, -29.6, and -19.6 respectively related disturbing experiences as a result of the extremeness of the cultural encounter.

HN reports how her expectations about one of the most efficient public transportation systems in the world turned into an experience which made her strongly consider returning home at the beginning of her internship period:

It was a roller-coaster of emotions. So, like everyone has said about transportations, Japan is like, really convenient in terms of that, but I was actually excited to come home because of the trains in Tokyo. [...] when you go to work, you're literally squished into each cart. There's like, they don't limit the number of people that can go in. So, there are people pushing themselves in and you're just like a sandwich inside the cars every single day, five days a week. I think after two months of interning, I was, like, oh I can't do this life anymore. I want to go home, and Japan is hot during the summer as well.

As an Asian American whose family is originally from Vietnam, HN also experienced the difference in levels of comfort level in what they considered “public” versus “private” sphere between Japan and the US. What she had conceived as private sphere was turned completely upside-down. She tried out the hot baths:

So I, think the shocking part to me was, it was kind of interesting how, like, Japanese people would like to be all exposed and bathed together happily. But then when they have clothes on within society, they're kind of just all reserved and shy. So, I think that was culturally interesting to me [...] the hot water just, like, di-stresses your body. At some point you just give in like I don't care anymore.

While in HN's case the shock about public bath experience and her observation that public and private sphere (complete openness despite usual reservedness) were mixed up compared with what she was used to, another female student KK, of West-African ethnicity, who had the same experience but had gone into Japan at IDI Acceptance stage level and remained there throughout, seemed to have embraced the opportunity with more openness and curiosity despite the initial shock and despite being perceived as very different from the locals due to her skin color. KK related a similar experience as HN yet processed it differently:

You can't wear like a swimsuit in there because of hygiene and all that. So, you come into that, and then we're like, okay, it's okay. We're just gonna use the towels to get in there, like at least inside, until we're getting to the water and then, when I opened the door, the first thing I saw was the professor! [...] There were smaller towels. I just covered the front. Once we got into the water, it was like just so relaxing that I just wanted to try all

the other things like the open air bath, the soda. Then we went back to the water and left to eat and went back again to the hot springs, so right, yeah, I guess as soon as we got into the water everybody was like oh this is great!

The perception of differences in shopping culture such as being confronted with total quietness in Japanese shops and people's general reservation to talk to folks they were unfamiliar with, was reported by SL, himself a highly introverted person. It shows that the – as he perceived it – unfriendly environment he encountered did not help turn around his own reservation to immerse and just strike up a conversation as his more outgoing peers had done.

There's a lot of stuff online about happy foreigners and stuff. Um, but the Japanese are usually quite quiet, and the cashiers don't speak to you at all. You can go in the shop without saying one word, which is interesting. Um, and if you tell people that you talked to a stranger, they're like you're very courageous. Like you're like super amazing. So that's why, when I got back to America, I only kind of got back into the flow of being friendly to other people.

Discussion:

Expanding prior research on determining individual or program design related factors that impact students' potential to develop interculturally when engaging in long-term study abroad [16], [9], this study discovered a few more factors that were positively correlated with intercultural growth, adding to the ones already mentioned in prior literature: In the "cognitive dimension", we found that a long-term engineering experience combining study and work abroad significantly impacts 'awareness of professional growth' and 'awareness of change in personality/identity. In the "behavioral dimension" we found that 'developing life skills/efficacy' is a category that adds an important factor to the success of an academic/experiential immersion abroad experience and explains why students return feeling empowered to "do anything" back at home. In the "affective dimension" we determined that a new category "encountering extreme cultural difference" was negatively correlated with intercultural growth in some of the students who regressed significantly according to their IDI post assessment scores. This means that in several students' comparison between IDI score results and interview analysis the latter qualitative analysis confirmed the quantitative findings yet added much more nuance as to why the regression might have happened and what the holistic student experience had been comprised of.

Some reservations have been raised about giving quantitative scores too much meaning [17], [18] since they do not fully capture the holistic experience of each student. This might explain why AS, a chemical engineering student with a high level of German proficiency skills, who performed credit-bearing research during his studies, excelled at his six-month internship at BASF and was lauded by his supervisors, regressed from minimization to denial by -27.68 pts. Nothing in his reflections/responses indicates what led to this drop, on the contrary, AS mentioned: "The actual experience in Germany for my personal experience went pretty well. I enjoyed the independent research project, which I took part in through the institute of particle technology. That was a major factor, and I feel like it was worth it for the language aspect as well as for the credits aspect." Another mystery relates to an African American computer engineering student who had gone to Japan. KS had served as ambassador for the program prior to departure,

garnered prestigious Boren, Freeman Asia and Gilman grants to support his year abroad and had a highly successful internship experience at Shimadzu in Kyoto. He had also taken on an unofficial leadership position in the group of peers he went abroad with, often organizing trips and coaching them on. This student landed a job in the defense industry post study abroad, yet also presumably regressed by -19.4 points!

Limitations and future directions:

While our qualitative analysis through small Focus Groups yielded insightful results which could partially explain the mixed results of the quantitative data, they were limited by the fact that some students, especially the more introverted ones, may not have wanted to share their experiences, insights, and potential traumas in depth with the whole group of peers. To fully understand why some students had such high regression scores in the post IDI test, we would have to set up longer interviews with individual students to dig deeper into how they processed their experience abroad.

One hypothesis worth investigating further is that possibly this round's late timing of the IDI post-test (late November) after the returning students' enthusiasm had waned off and the reality of the above-mentioned back-to-the-academic-grind took over, with students' resenting of having to return to school after having gotten a taste of independence and what life might look like after graduation, may have influenced some students' low performance or willingness to even take the test again. All of these hypotheses would need to be verified, of course, in further one-on-one follow-up conversations with the respective students.

Conclusions

Based on the analyses above, our recommendation is that educators including those involved in managing our own program, may want to think about implementing a thorough debriefing protocol after re-entry from study abroad which includes group focus interviews and individual conversations, ideally with an IDI trained coach. Further we learned from this particular cohort what impact timing can have on an effective design of a long-term study abroad program. While it has many benefits such as access to job fairs, scholarship and graduate application advisors, leadership roles as ambassadors and more, both for the students and for the program, to send cohorts abroad in their senior year and bring them back to campus after a year-long, potentially life changing experience, also has its drawbacks. As CH sighed, "I miss my job, the fact that when I left Bosch, they were like, hey, if you said you were staying, we would have given you a position right now." Others commented about transitioning into the high pressure 5th year as a graduating super senior, as AC who recalls that "the pressure you know just really hit me like a truck because I do put a lot of pressure on myself to perform, combined with the intensity applying for graduate school on top of it and the pressure to figure out my future now it's not like I have a year to do it." Having to fall back to "the same old" after experiencing strong positive personal change is another drawback. KK's "I don't know, it was weird because basically I felt like I put my life on hold, then went to Japan became another person and then came back and resumed that old life, how it worked, how I was. So, I had so much energy in Japan trying so much stuff and be like extroverted and then I came back and I'm just like doing school and going back home basically. So, I still kind of feel like, disconnected."

Perhaps designing a program to take place in students' final 5th year so that they can transition seamlessly into fulltime work and seeing the year abroad as a steppingstone in that direction, might be a better solution.

Appendix 1

Questions for IDI focus groups - week of Oct. 23rd (~1-hour interviews)

Warm-up:

- 1) How did your year abroad experience go in general? Specific examples of what was great/ needs improvement?

Give feedback and evaluate:

- 2) How did a) the semester of study b) the internship experience help you with
 - the development of language skills?
 - fostering intercultural communication learning?
 - engineering learning?
 - life-skills learning?

Elaborate:

- 1) Did some interesting cultural misunderstandings happen to you when you studied abroad? When that happened, how did you react? How did you solve the misunderstanding?
- 2) Did you experience some form of culture shock? What was the thing you missed most from the US? What challenges did you face engaging with people from your country's culture?

Reflect:

- 1) What successful strategies did you use to integrate into the new country and culture?
- 2) How did you change?
- 3) Do you notice a different “you” (personality) when you speak in the foreign language?
- 3) How did you feel coming back to the US after a year abroad? What activities/ which strategies helped you re-integrate back to the US and to campus

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