

# **Do We Design for People or to Make Things?: Student Motivations, Barriers and Mindsets in an International Humanitarian Engineering Experience**

Reilly Sullivan, Faculty of Science, Department of Biology  
Libby (Elizabeth) Osgood, Faculty of Sustainable Design Engineering  
University of Prince Edward Island

## **Abstract**

Service-learning has emerged as an effective pedagogy that develops participants' cognitive and affective competencies through working with communities and applying their education in real-world settings. In engineering, service-learning projects help participants shift their focus from the device or design to the people who will use it. In February 2023, 17 engineering students traveled to Honduras with the goal of designing a sustainable water system in partnership with a rural community. The students who attended the international experience were invited to participate in a study through completing a pre- and post-trip survey. Similarly, the students who originally planned to go on the trip but decided not to attend also completed a survey. Items on the instruments inquired about participants' motivations and barriers to attend this international humanitarian trip. Additionally, the study explored whether students' mindsets shifted from being thing-focused to being more people-focused during the experience.

Participants returning from the trip were significantly more people-focused than before the experience, and they cited their favorite part of the experience was the relationships that they developed. Motivating factors to attend were to gain engineering experience, travel to a new place, and provide for others. Over half of the participants who ultimately decided not to go cited financial reasons and the time commitment as large barriers. Surprisingly, health and safety and the great travel distance were not barriers for them, nor were they a concern for participants who returned from the experience. It was found that international students were especially disadvantaged as additional transit visas were required for them to travel to the destination. The findings suggest a need to make the experience more inclusive and to further investigate how these experiences can contribute to students' becoming more person-oriented.

## **Introduction**

International Service-Learning (ISL) combines the principles of service-learning with travelling abroad, allowing students to apply classroom skills while providing service to international communities [1]. For engineering students, this may involve learning new applications and skills, implementing designs, working alongside professionals from various backgrounds, and/or gaining perspective on people's lives in new cultures. As engineering tends to be more of a Thing-Oriented (TO) profession, where there is heightened focus on the design at hand, there are times where they can forget about the people the design is aimed at supporting [2]. By meeting these individuals firsthand and learning about their situations, there is potential for engineers to adopt a more Person-Oriented (PO) mindset. A mindset shift that encompasses thinking about engineering in a more social capacity will increase the engineer's awareness of stakeholder concerns and promote the employment of empathy in their designs [2]. The combination of having a PO mindset plus the benefits of ISL may develop more empathetic and culturally aware

engineers. Engineering students in particular tend to be more TO, as compared to practicing engineers who are more PO as they have more real-life experience [2]. By analyzing student mindsets before and after their ISL, there is an opportunity to understand how their experience impacts their identity as engineering students, and whether their focus shifts from TO to PO.

Depending on the student and their background, they may have different motivations to be a part of ISL experiences, and they may face unique barriers that prevent them from attending. Identifying motivations and barriers allows post-secondary institutions and organizations who offer ISL experiences to recognize areas of improvement. ISL experiences are often expensive and involve long travel hours (if not days), pose uncertainty about health and safety, and require a substantial time-commitment. For students to be able to participate in ISL they must have the means to overcome these barriers, but also have the right level of motivation to attend and optimize their experience. Recommendations can be created to promote the accessibility of ISL experiences built on what students consider motivations and barriers.

Although intended to be beneficial for all parties involved, ISL experiences, especially short-term ones, can pose risks to students, and even more so community members [3]. Risks can arise when there is a lack of project sustainability, power imbalances, and/or under-qualified volunteers [3]. To minimize these potential harms, classes can partner with organizations that prioritize sustainable development. Additionally, instructors can implement educational requirements so students understand critical elements of international volunteering, background on the country they are travelling to, and technical skills needed to perform the work. Though these recommendations do not completely diminish potential harms, they do attempt to reduce the risk with long-term solutions and knowledgeable/qualified participants.

At the University of Prince Edward Island (UPEI), various ISL experiences are offered to students. In 2021, in the Faculty of Sustainable Design Engineering (FSDE), one faculty member and a group of 17 students participated in a 10-day ISL experience in rural Honduras, referred to in this paper as an International Humanitarian Engineering Experience (IHEE). Initially, there were more than 50 students interested in the experience, but most of them decided not to attend. The interested students co-created a course with the faculty member that combines international humanitarian engineering education with activities to prepare them for their IHEE, to ensure they possess the necessary skills and cultural preparation which could allow them to make valuable contributions during the trip, and to reflect on the IHEE upon returning home so they could integrate it within their coursework [4,5]. Appendix A contains the major topics in the course.

Though over 50 students were interested in attending the IHEE, many of whom helped to design the course, only 17 students participated. This study seeks to understand why. Students who attended the IHEE and those who were interested in the experience but did not attend were invited to participate in an institutional ethics-approved study. Pre-IHEE surveys assessed participants' motivations for going on the trip as well as barriers preventing them from attending. Students who went on the IHEE were invited to complete a post-trip survey to capture their experience and determine whether there was a mindset shift from TO to PO.

The research objectives presented in this paper are twofold:

- 1) What are the Motivations and Barriers towards participating in an international

- humanitarian engineering project?
- 2) Do participants change their person- or thing-oriented mindset during an international humanitarian engineering project?

Documenting the barriers and motivations can improve the delivery and planning of future ISLs. Determining whether there is a connection between ISLs and becoming more PO can provide future research opportunities.

## **Background**

### *Land Acknowledgement and Positionality Statement*

The data for this research was collected while in Epekwitk, Mi'kma'ki, the traditional, unceded, and unsurrendered lands of the Mi'kmaq people. The authors are appreciative to live, work, and study within these lands. They are both women of European descent. Reilly is a biology student who founded the UPEI Global Brigades Chapter and has seen the impacts of these experiences on all stakeholders during two Medical Brigades experiences. She seeks to understand factors surrounding these humanitarian experiences so more students have the opportunity to participate. Libby has taught the IHEE course for two years, has been a service-learning design instructor for 13 years, and seeks to make ISLs as inclusive as possible for all engineering students.

### *Global Brigades Organization and Engineering Brigades*

The IHEE was organized in collaboration with Global Brigades: an international non-profit organization that works to sustainably resolve health and economic disparity [6]. University Global Brigades chapters across Canada and the United States allow students to work alongside local professionals and community members during ISLs to contribute to sustainable development in underserved communities. Global Brigades promotes a holistic model that addresses three major sustainable development goals (SDGs): Good Health and Well-Being (Goal 3), Clean Water and Sanitation (Goal 6) and Decent Work and Economic Growth (Goal 8).

Engineering Brigades (the IHEE) falls under the Clean Water and Sanitation Goal, as participants and professionals work together with communities to design a water system that provides clean water to residents. From the student perspective, the brigade involves identifying community needs, surveying, calculating necessary materials, and providing a report (stamped by the professional engineer) of a water system that can be implemented by the community. While students are only on the ground for a week, Global Brigades maintains a long-term relationship with the community to identify community needs, aid in fundraising with local government, and connect multiple university teams as labor for the design and construction of the water system. In this project, community collaboration in the design a water system includes initial identification of needs, individual house visits to each community members, and two meetings with Global Brigades staff, community members and students: an orientation at the start and a design presentation at the end to answer questions and revise the design.

To attend the brigade, participants are responsible to fundraise their airfare, accommodations, and ground fees (food costs, Global Brigades staff, transportation, security, supplies, and program sustainability). The air travel from Atlantic Canada to Honduras takes multiple days and

requires layovers in the United States. International students must also secure transit visas for the US and to enter Honduras, which can necessitate additional trips to embassies in Montreal.

## Methods

The sample includes 22 participants divided into two groups: those not going on the experience ( $n_{\text{INT}}=13$ , interested or “Did Not Go” group) and those going on the experience ( $n_{\text{WENT}}=9$ , “Went” group). The pre- and pos- surveys were administered using Microsoft Forms. Demographics are shown in Table 1. Gender data are representative of typical demographics within the student engineering population at UPEI.

Table 1. Participant Demographics by Group.

	<i>n</i>	Gender		Citizenship		
		<i>Men</i>	<i>Women</i>	<i>Canadian</i>	<i>Non-Canadian</i>	<i>Blank</i>
<i>Went</i>	9	7 (78%)	2 (22%)	7 (78%)	1 (11%)	1 (11%)
<i>Did Not Go</i>	13	9 (69%)	4 (31%)	7 (54%)	6 (46%)	-

The pre-experience instrument consisted of qualitative items with a written responses for participants’ *Motivations* for going on the trip (1 item,  $n_{\text{TOT}}=22$ ), *Barriers/Concerns* surrounding the trip (1 item,  $n_{\text{TOT}}=22$ ) and *PO/TO mindsets* (7 items,  $n_{\text{WENT}}=9$ ). Items are listed in Appendix B. The Went group ( $n_{\text{WENT}}=9$ ) was also administered a post-trip instrument with qualitative items about their favorite part about the IHEE (1 item, comparable to pre-trip motivation), biggest concern while on the IHEE (1 item, comparable to pre-trip barriers/concerns), as well as the same 7 pre-experience PO/TO items and 6 new PO/TO items. There was 1 participant who only completed the pre-trip survey (no post-trip responses), and 2 participants who only completed the post-trip survey (no pre-trip responses), so their motivations, barriers and PO/TO answers were assessed in group totals but there were no pre-/post- comparisons. There were 7 participants who completed both the pre- and post-experience instruments.

The *Motivations* and *Barriers/Concerns* data were reviewed, categorized, and coded by the first author using conventional content analysis [7]. Codes were reviewed and confirmed by the second author. There were 5 Motivation categories and 6 Barrier/Concerns categories (see results), plus one option in each for answers that strayed outside these category descriptions (“Other”). Each motivation and barrier category was assessed using a 2-point scale, where 1=Was a Motivation/Barrier/Concern, and 2=Not a Motivation/Barrier/Concern.

The *PO/TO mindsets* data was assessed using a 2-point scale, where 1=*PO response* and 2=*TO response*. PO/TO items were grouped into three categories: unprompted, prompted, and combined. The focii of the unprompted items were about a different topic, such as, “Describe your previous design project in a sentence or two.” If participants wrote about people, stakeholders, or users, the item was coded as PO. If no people were considered, the coding was TO. The focii of the prompted items were about people or social justice, such as, “Who were the stakeholders for the project?” It is expected that these will be more people focused, but if they are not, then it is especially telling of how TO the person is.

Once cleaned, this quantitative data was uploaded to JASP for statistical analysis. Contingency tables analyzed differences in *Motivations* and *Barriers* between groups (Went versus Did Not

Go). Paired t-tests were used to compare answers before and after the IHEE for: (pre-) *Motivation* and (post-) *Favorite Part*, (pre-/post-) *Barriers/Concerns*, and (pre-/post-) *PO/TO mindsets*. Additional independent variables were explored such as gender and citizenship, but findings were not meaningful, likely impacted by the small sample size.

## Results

1) *What are the motivations and barriers towards participating in an international humanitarian engineering project?*

Using qualitative data from participant responses, five *Motivation* categories were defined, as shown in Table 2. Note that two participants did not provide information.

Table 2. Overview of Participant Motivations for Attending the IHEE.

<i>Motivation</i>	<i>Description</i>	<i>Total Num</i> <i>n<sub>TOT</sub> = 20</i>	<i>Went</i> <i>n<sub>WENT</sub> = 8</i>	<i>Did Not Go</i> <i>n<sub>INT</sub> = 12</i>	<i>Excerpt</i>
Real-World Engineering Experience, Knowledge, Skills	Participant shows a desire to understand engineering practices and acquire new technical skills in a “real-world” setting, outside the classroom.	13 (65%)	7 (88%)	6 (50%)	“...apply sustainable design techniques learned in the classroom setting to a real-world issue.” “This experience will allow for a real-life application of engineering and design, and hopefully, we will be able to see our work come to life.”
Unique Travel Opportunity	Participant is drawn to the opportunity to travel to a new place and defines it as unique for their degree program.	12 (60%)	6 (75%)	6 (50%)	“This trip will be a whole new experience for me, not only because of the atmosphere and environment that will be new to me, but also the project that I will be taking part in and assisting with.”
Helping People	Participant is driven by the opportunity to provide for others.	11 (55%)	6 (75%)	5 (42%)	“... this is an excellent initiative to provide help to those in need. Clean water is something many people take advantage of, myself included, though after signing up for this trip I have been much more aware...being able to offer this to a community is very special...”
Broaden Perspective Cultural Awareness *	Participant desires to be immersed in a culture different from their own, providing a broader perspective of the world.	7 (35%)	5 (63%)	2 (17%)	“I also want to see how different things are applied around the world and how culture differs from where I am from. Going on this trip will help me gain a larger perspective of the world and how different some places can be, and how people live on a day-to-day basis.”
Personal Gain (Resume Course Credit, etc.)	Participant wants to put this on their resume, course credit, and/or as an extracurricular.	5 (25%)	1 (13%)	4 (33%)	“[The experience] would have been an addup on my resume”
Other	Motivation differs from established categories.	3 (15%)	0	3 (25%)	“Being able to work alongside like-minded individuals really enticed me to the brigade.”

\* denotes significant differences between groups  $p < .05$

Amongst both participant groups, 65% mentioned the Real-World Engineering Experience, Knowledge, Skills category as a motivation to go on the international humanitarian experience with 87.5% of the Went group and 50% of the Did Not Go group making up this percentage. 50% of the Did Not Go group and 75% of the Went group were also drawn to the uniqueness of the opportunity and location, and 75% of the Went group were motivated by the opportunity to help others.

Between both groups, the Broaden Perspective Motivation was less likely to be a motivation for those who didn't go but was more likely for those who went ( $\chi^2(1, N=20)=4.43, p<.05$ ), with a medium effect ( $\phi=0.47$ ). This indicates that broadening one's perspective could be a distinguishing motivation. Also, the Went group participants denoted a higher number of motivations in their written responses ( $\bar{x}=3.1$ ) as compared to the Did Not Go group ( $\bar{x}=2$ ), indicating they considered various elements of the trip. It is confirmatory that the group that went had more motivations than the group that was interested, but did not go.

### Barriers

Using qualitative data from participant responses, 6 barrier categories were created based on common themes, as shown in Table 3.

Table 3. Overview of Participant Barriers for Attending the IHEE.

Barrier	Description	Total Num <i>n</i> <sub>TOT</sub> =21	Went <i>n</i> <sub>WENT</sub> = 8	Did Not Go <i>n</i> <sub>INT</sub> = 13	Quotation
Health and Safety *	Participants have concerns about their health and wellbeing	7 (33%)	6 (75%)	1 (8%)	"I wasn't fully comfortable, even with reassurances ..., about the level of safety in Honduras."
Travel and/or Location *	Participants have concerns about travel and/or the location they are travelling to.	7 (33%)	4 (50%)	2 (15%)	"I am an international student and travelling to Honduras is a challenge because of the all the visa stuff and the specific travel routes"
Financial *	Participants have concerns about the associated costs.	7 (33%)	0	7 (54%)	"I was ... conscious about the potential cost burden of the trip, which was stated could reach up to \$5000."
Commitment *	Participants have concerns about the level of commitment the trip required.	7 (33%)	0	7 (54%)	"Since I was already working at the FSDE and another place, there was little time to help in organizing and participating in the fundraisers, amidst all the deliverables from my 5 courses"
Social Pressure	Participants are influenced from peers and/or family.	1 (5%)	0	1 (8%)	"My parents were unsupportive"
Design Concerns	Participants have concerns that the design would not work or have positive impact.	3 (14%)	3 (38%)	0	"That our project won't be as big of a change or improvement as I/we hope it to be or it won't be finished or successful."
Other/Personal	Concerns outside the other categories.	4 (19%)	0	4 (31%)	"I'm only in my first year so I wasn't able to get a [course] credit"

\* denotes significant differences between groups  $p<.05$

Four barriers were prominently mentioned between both groups: Health and Safety, Location/Travel, Financial, and Commitment (33% of the total number of participants), but the distribution of concerns differed greatly between groups. In the Went group, participants were more likely to see Health and Safety as a barrier/concern, ( $\chi^2(1, N=21)=10.10, p <.001$ ) with a large effect ( $\phi=0.69$ ), as well as Location and/or Travel ( $\chi^2(1, N=21)=4.95, p <.05$ ), with a large effect ( $\phi=0.48$ ) compared to those who did not go. Interestingly, the Went group participants were less likely to see Financial and Commitment as barriers, whereas the Did Not Go group were more likely to consider them challenges ( $\chi^2(1, N=21)=6.46, p <.05$ , for both) with large effects for both ( $\phi=0.55$ ). No one in the Did Not Go group selected Design Problems as a concern, but there was a balance in responses from the Went group with this concern ( $\chi^2(1, N=21)=5.69, p <.05$ ), large effect ( $\phi=0.52$ ).

Qualitative data also shows that in the Did Not Go group, there were more constraints for the international students, primarily travel and financial related. One student explained, “I cannot afford it as I am an international student” and “It is very hard to get a visa to go to the USA, and the trip was pretty costly”. This data suggests that improvements need to be made to better accommodate those who do not have Canadian citizenship status.

*2) Do participants change their person- or thing-oriented mindset during an international humanitarian engineering project?*

TO and PO mindsets were assessed for only those who attended the IHEE and completed both the pre- and post-surveys ( $n=7$ ). First, their motivations and barriers are compared, then the additional TO/PO items. Though motivations and barriers could have been addressed in the first research question, the results better align with the second question.

For the Went group, the results were compared to see whether participant motivations for going on the international humanitarian engineering experience matched their favorite part about the experience, and if their pre-trip barriers matched their concerns during the experience. Samples are shown in Tables 4 and 5 respectively. An interesting comparison was made between the participants’ original motivation for going on the trip and their favorite part of the trip. In the pre-trip answers, participants included an average of 3.1 motivations per participant, but upon return, participants selected only 1 favorite part, which primarily focused on the people they met. In some cases, both pre-trip and post-trip responses show indications of a PO mindset, but the fact that their sole favorite part is people-focused indicates that the experience may have developed their ability to regard engineering in a more PO manner.

Similarly, looking at pre-trip barriers and concerns during the trip, there is a shift in mindsets concerning the people they met during the experience. Before the trip, most participants had concerns specific to their health and safety, but in post-answers, there is minimal concern for health or safety and more about whether the design they made would be useful to the community. This reverted focus to the people suggests not only a mindset shift but attests to the effectiveness of the host organization in providing a safe and comfortable environment.

Table 4. Comparisons of Pre-Trip Motivations and Post-Trip Favorite for Three Participants.

<i>Pre-Trip Motivations</i>	<i>Num categories</i>	<i>Post-Trip Favorite Part(s)</i>	<i>Num categories</i>
“Being able to travel at all, especially during my education, is very exciting to me as I have never been outside of the country. I look forward to learning all different things about the local culture and providing a substantial change to those in need. I have always looked for various opportunities to help others, which is a huge opportunity to get involved and make positive changes. This experience will allow for a real-life application of engineering and design, and hopefully, we will be able to see our work come to life....”	4	“The people. Every single person there showed so much interest in us and who we are and what we were like. We wanted to know the same things back. The people that we got to know may not be wealthy financially, but they are so wealthy in so many other ways, they have family, community, culture, dance, food, laughter and so much more that is just so rich in its own way.”	1
“An opportunity like this does not present itself very often. I think this is an excellent initiative to provide help to those in need. Clean water is something many people take advantage of, myself included, though after signing up for this trip I have been much more aware. This is why I think it should be convenient and at the very least accessible to every single person on the planet, being able to offer this to a community is very special. I think this will also be an incredible opportunity to learn more about different cultures, for real-world engineering experience, and to really appreciate how fortunate we are.”	4	“My favourite part of this trip was making connections with all of the people I went with. I really feel like we all got closer and that we wouldn’t have without this opportunity.”	1
“I really want to get experience with working in developing countries, and learning about the constraints they have within their engineering. Creating designs for developing nations will be difficult without knowing their situations.”	3	“My favourite part was interacting with the children of the small communities.”	1

Table 5. Comparisons of Pre-Trip Barriers/Concerns and Post-Trip Concerns.

<i>Pre-Trip Barriers/Concerns</i>	<i>Num categories</i>	<i>Post-Trip Barriers/Concerns</i>	<i>Num categories</i>
“I’m not sure about the safety situation in Honduras.”	1	“I was worried that what we did would not have a major impact on the community in a positive way.”	1
“I believe this will be a fantastic experience and trip. The only worry I can think about is something happening down there like an injury or something.”	1	“My biggest worry during the trip was that I would not make something that would suit the community’s needs.”	1
“Despite the usual worries of traveling, including getting sick or losing something, I hope to provide useful help, as I have never done anything like this before.”	3	“My biggest worry was safety during the trip because we were going to Honduras which is the most dangerous country in Central America. I definitely never felt unsafe though throughout this trip due to the staff and organization.”	1



Next, Table 6 shows the mean scores for the prompted, unprompted, and combined items. Recall that TO is coded 2 and PO is coded 1, so a movement from high to low indicates a shift to PO. A paired samples t-test showed a significant shift from TO mindsets to PO mindsets in the unprompted category ( $t(5)=3.191, p<.05$ ), as well as combined ( $t(5)=3.360, p<.05$ ). Although the change in the prompted question category was not significant, there was still a shift towards a PO mindset in the post-trip answers ( $\bar{x} = 1.472$ ).

Table 6. Shift from Thing-Oriented to Person-Oriented Mindset.

Question Type	Description	Pre-Trip Mean ( $\bar{x}$ )	Post-Trip Mean ( $\bar{x}$ )
Unprompted *	Wording is not leading and focused on different content.	$\bar{x}=1.63$ (5 items)	$\bar{x}= 1.39$ (7 items)
Prompted	These questions influence participants to consider people in their answers.	$\bar{x}= 1.58$ (2 items)	$\bar{x}= 1.47$ (4 items)
Combined *	Unprompted and prompted questions assessed together	$\bar{x}= 1.62$ (7 items)	$\bar{x}= 1.41$ (11 items)

\* denotes significant differences between groups  $p<.05$

## Discussion and Conclusion

The motivations for attending the IHEE between groups did not vary significantly, but there was a higher number of motivations for those who went on the IHEE compared to those who did not. Key takeaways are the most mentioned motivations for attending the IHEE: Real-World Engineering Applications, Unique Travel Opportunity, and Helping People. The combination of these three things reinforces the principles of ISL: applying academic teachings, international travel, and providing meaningful service to a community [1]. Recommendations may be to continue promoting these motivations to a wider berth of students to attract more participants. After participants returned, nearly all participants identified that meeting people and learning about the culture were their favorite parts of the experience. This is an important finding as the participant's motivation changed from an exciting opportunity to design something to developing an increased social perspective. This attests to possible mindset shift during the experience that were influenced by building relationships with community members, engineers, and Global Brigade staff.

Barriers between groups differed greatly. While those going on the IHEE worried about things that could go wrong during the actual experience, like their health and safety, those who did not go were concerned with the barriers in the preparatory phases such as finding the money to be able to attend or the time commitment to fundraise and attend the IHEE. Non-Canadian students were especially disadvantaged due to the additional visa requirements for the US and Honduras. The one international student who was able to attend the IHEE required two visas to travel to Honduras, one to pass through the US for flights and the other to enter Honduras. Both visas could only be obtained in-person, one in Montreal and another in Toronto. This student had to

have two additional trips than the domestic students, at a great time and financial cost. The difference in the percentage of international students between the two groups is especially troubling, as it suggests the opportunities are restricted to domestic students. This finding should be a call to action for institutions and ISL organizations to find ways to better accommodate international students with financial aid opportunities, or to book travel routes that do not go through the United States. Also, as one of the major time-commitments associated with the IHEE was fundraising and recruiting sponsorship, the reduction of financial barriers may proportionately decrease the impact of time commitment barriers. As a leadership member with Global Brigades university chapters, this also indicates that there needs to be more focus on effective fundraising and sponsorship recruitment to ensure every participant has an equal opportunity to attend the IHEE.

Following the IHEE, those who attended had little to no concerns, except about the usefulness of their design in the community. As concerns were primarily tied to Health and safety, this sends an encouraging message to other participants who may have these concerns travelling. It also speaks to the high quality of systems that Global Brigades has in place to assure the safety and comfort of participants during their experience. The shifts in mindsets show promising results about how the IHEE impacted student perspectives on focusing on the people and not things within engineering. Although the sample size was small, the findings indicate that there are invaluable components of ISL that shift TO mindsets towards PO mindsets. Particularly, the shift in unprompted mindsets is reassuring because these questions assess participants in an unbiased manner, allowing the interpretation of what they think.

The primary limitation of this study is the small sample size. Results are presented to encourage other researchers to investigate existing ISL experiences at their institutions, particularly with an eye towards determining whether students are people- or thing-focused. Recognizing that engineering is essentially problem-solving to help people, the tendency is too often to forget about the people. Engineering educators can recognize the ability for ISL experiences combined with curricular courses to emphasize people over the design, to help students become more people-oriented.

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## Appendix A: Course Components

The major topics of the International Humanitarian engineering course are summarized in Table A. The course was co-created by the students interested in the IHEE and the faculty member.

Table A. Course Components for the IHEE.

Pre-IHEE Activities	During IHEE Activities	Post-IHEE Activities
UN Presenter on Sustainable Development Goals	Professionalism Discussions	Calculate Carbon Footprint of the Trip
Water Waste Treatment Plant Tour	Active Participation in Design	Debate on Merits of the Trip
UPEI and Global Brigades Mandatory Training on: <ul style="list-style-type: none"> <li>• Honduras</li> <li>• Spanish Phrases</li> <li>• Ethical Volunteering</li> <li>• Cultural Preparation</li> </ul>	Daily Reflections	Essay Summarizing Both Sides of the Debate

## Appendix B: Instrument Items

The items on the Instrument are shown in Table B on the next page. They are categorized by the instrument (pre-, post-, or both) and whether it is prompted or unprompted for PO/TO.

Table B. Items on Pre- and Post- Instruments.

	<i>Instrument</i>		<i>PO/TO</i>	
	<i>Pre</i>	<i>Post</i>	<i>Unprompted</i>	<i>Prompted</i>
Why are you interested in going on this trip?	x		x	
What was your favorite part of this trip?		x	x	
What are you most worried about?	x		x	
What was your biggest worry during the trip?		x		
Finish this sentence: Engineering is	x	x	x	
Finish this sentence: Social justice is	x	x		x
Finish this sentence: After I graduate, I hope to	x	x	x	
How appropriate is it for practicing engineers to consider social justice when designing engineering solutions? Explain.	x	x		x
Describe 2 previous (or current) design projects (in a sentence or two):	x	x	x	
Describe a design project that you worked on while in Honduras (in a few sentences)		x	x	
Has this experience changed how you feel about engineering?		x		
What did you learn during the trip?		x	x	
What were the most useful skills that you used/gained/developed?		x	x	
Who were the stakeholders for the project?		x		x
What did you learn which you did not previously know, about the social impacts of engineering?		x		x