

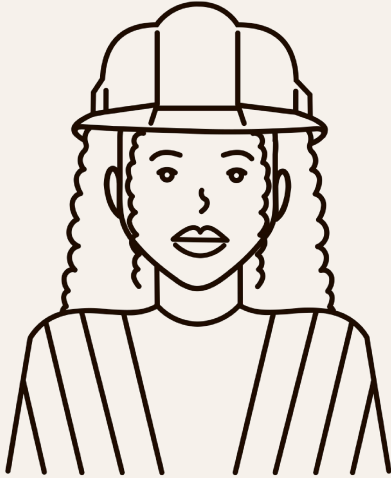
Exploring Engineering Graduate Students' Reassessment of Social Impact Expectations:
The Role of Humanitarian Engineering Learning Environments

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Humanitarian Engineering Students

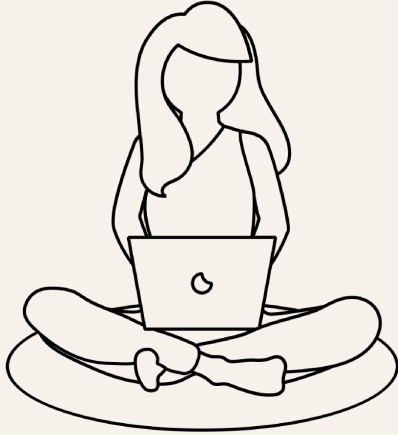
– Are freaking out
a little bit

Engineers.



- Are awesome
- Are sometime associated with being ahistorical and not focusing on the social and environmental impact of our work
- For instance, engineers have implemented infrastructure (e.g., wastewater treatment centers, bridges, transportation, and energy supply) whose placement and quality perpetuate institutional and environmental racism (Winner, 1980; Yates & Murphy, 2019).

Humanitarian Engineer Students



- Are being trained to care about social and environmental equity
 - They are being trained to carry a *“concern with the unequal and unjust distribution of access to basic services such as water, sanitation and shelter, and (who) place emphasis on identifying the drivers, determinants, and solutions toward increasing equitable access to reliable services”* (Thomas et al. 2021)
- Are understudied
 - Studies have shown that HE orientated undergraduate students struggle to meet their social and environmental impact goals in engineering industry (Litchfield and Javernick-Will 2017; Smith et al. 2018)
 - But... no studies have looked into how a graduate education and experiences impact students confidence in having impact in their careers.

We asked:

Are/ in what ways are students questioning their social impact career goals throughout a HE graduate program and extended HE experiences?

What learning experiences and environmental cues are prompting this?

We did this by

Longitudinally interviewing **47 students from 7 US HE graduate programs over two years** and asked

- Please describe your confidence to in having a positive social impact as an engineer
- How have your career goals changed over the semester?
 - What prompted this change?

Deductively coded interviews for

Career Impact Outcome Expectations: the outcomes which students expect to achieve as part of their careers

Inductively coded interviews for

Themes of the worries students carried about having impact

Limitations of engineering firms changing radically and quickly

The learning experiences that influenced students expectations

Internship

Coursework, HE research,, and HE projects (student-led projects to improve infrastructure services)

So I think their concerns (in the internship) were more about the day-to-day experiences of minorities versus structural racism and colonial legacy, which is something I'm interested in fighting for. (...) Yeah, It was a bit superficial and talking just about DEI. (...) I remember (there was) one panel on imposter syndrome. They had three white American women and one foreign national man. And one of the questions asked was, how do you deal with being a woman of color in the in the stem space? And no one could answer it.

**Yes, students are
questioning their
social impact career
goals**

The HE sector cannot address environmental and social equity

Based on what I have learned in my HE coursework, projects, research, and internships

Learn about greenwashing, and shallow corporate social responsibility missions

Limitations of social and environmental justice conversations and focuses in engineering firms

Exposed to HE and engineering organizations that are not centering the needs of marginalized communities



16 students discussed the limitations of engineering firms changing radically and quickly

The HE sector cannot address environmental and social equity

*One of my classmates who worked in India said, “(...) I was working with farmers and directing them to get help from this nonprofit. But I ended up filling in all the forms for them.” She said “**we have given people power and agency, but we have taken away sovereignty.**” We have now **conditioned the world to want the same lifestyle and have the same values** as the United States, which is based **on a model of individualism and consumption**. So, now we have told the world what to want, and we have given them tools on how to go about getting that, **but then it costs a lot of problems like climate change and wars, etc.***



30 students questioned whether HE projects will more likely not help or cause harm to marginalized communities

16 students discussed the limitations of engineering firms changing radically and quickly

Based on what I have learned in my HE coursework, projects, research, and internships

Case studies and larger reviews of failed and harmful HE projects

Work with marginalized research participants could feel exploitative

The HE sector cannot address environmental and social equity

A big takeaway was development is inherently a racist, classist endeavor. Like, OK, then why are we all here? (My intro development class) was like just. Just guys don't even work in development. (... and my next class told us) "You need to make surveys, for a community you've never been to, so you can later put in data for evaluating your technology, which doesn't exist yet" Yeah, **very contradictory information on what was going on and how to approach this.**



16 students felt HE organizations needed to change but were unclear how and if they already were

30 students questioned whether HE projects will more likely not help or cause harm to marginalized communities

16 students discussed the limitations of engineering firms changing radically and quickly

Based on what I have learned in my HE coursework, projects, research, and internships

Trying to research how HE organizations are becoming more effective

Learned a lot about HE models who center equity, sustainability, and local contexts

Were pushed to use processes that didn't center equity, sustainability or the local context

The HE sector cannot address environmental and social equity



26 students worried about the external barriers to HE projects being sustainable and effective

16 students felt HE organizations needed to change but were unclear how and if they already were

30 students questioned whether HE projects will more likely not help or cause harm to marginalized communities

16 students discussed the limitations of engineering firms changing radically and quickly

Based on what I have learned in my HE coursework, projects, research, and internships

Case studies on the day to day barriers of HE projects

Exposure to ongoing root causes of inequality

Tensions between making successful and sustainable HE projects and local policy and culture

Balancing making best projects with funding the organization

The HE sector cannot address environmental and social equity



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*So reading the divide a lot of issues came up that I just never thought about. For example, it talks about how capitalism is a huge driver of global inequality, and the arguments that he puts forth are super, super compelling for that. So then I really struggle like, okay, so capitalism is a driver of this. There's no way we're changing that. (...) **So that's something that I've been struggling with, knowing that some of the root causes of these things are so ingrained in our culture. How do you work in the field knowing that these underlying issues are still there?***

Exposure to ongoing root causes of inequality

Balancing making best projects with funding the organization

How might different learning experiences be affecting students?

- Classrooms and coursework may be “freaking students out”
 - In coursework students are learning the larger fundamental limitations, and paradoxes of development work
- HE projects and research may sometimes work in contradiction to what students are learning in classroom
 - These spaces may be an ideal spot to experiment with create ethical HE projects and teach students the challenges of doing so
- HE internships may help ground students to the degree to which HE organizations are/are not and could further center equity and sustainability

What impact career expectations do we want students to have?

- How do we want students to balance creating sustainable, equitable, contextually relevant and realistic HE projects?
- Are we trying to create social justice activist engineering students?
 - What training would be needed to help students advocate for change in engineering organizations?
- Do we have good HE role models to show to students?
 - How can students both analysis for problems of HE organizations and what organizations are doing right?

Thank you!



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