



A Case Study on Macroethics and Social Justice at the University of [BLINDED], Canada

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Introduction and Background

Social justice has been a significant topic of conversation in recent years within the United States and both it and the related concepts of macroethics and sociotechnical thinking have been featured in multiple sessions at the American Society for Engineering Education's annual conferences. Although engineering is frequently taught from a fairly decontextualized, reductionist viewpoint ([1], [2], [3]), engineering practice is sociotechnical in nature ([4], [5], [6]). This disconnect may leave students ill-prepared for their future workplaces [7], and it may also create a false sense of what to expect from engineering practice that could impact persistence through engineering programs.

Social justice, macroethics, and sociotechnical thinking have a number of definitions varying by context. For the purpose of this paper, I propose three definitions aligned with engineering research, and then later examine attributes of other possible definitions from the data collected in the study.

Macroethics and **microethics** were defined by Joseph Herkert in [8] in a paper that reflected on various viewpoints of engineering ethics:

“Putting all these frameworks together, an interesting pattern emerges. Engineering ethics can be viewed from three frames of reference—individual, professional and social—which can be divided into ‘microethics’ concerned with ethical decision making by individual engineers and the engineering profession’s internal relationships, and ‘macroethics’ referring to the profession’s collective social responsibility and to societal decisions about technology.” (p. 374)

Social justice was defined by Jon Leydens and Juan Lucena as

“Social justice in engineering is: ‘engineering practices that strive to enhance human capabilities (goal) through an equitable distribution of opportunities and resources while reducing imposed risks and harms (means) among agentic citizens of a specific community.’” [9] (p. 4)

Finally, **sociotechnical thinking** was defined by Leydens and co-authors in [10] as “The interplay between relevant social and technical factors in the problem to be solved,” (p. 1) focusing on the problem definition and solution process.

Readers will note that each of these definitions come from engineering contexts, which reflects my background and prior work. Across the course of several projects in Colorado, USA, my team and I have studied various aspects of sociotechnical thinking, social justice, and macroethics among students and faculty affiliated with university-based engineering programs. We have identified both barriers and opportunities associated with integrating these concepts into engineering classes. For example, [11] examined the ways in which students perceived social

justice in a required engineering science core course and found that some students valued the ways in which such integration could help them to think ahead toward their future careers. In [12], we assessed the intersection of sociotechnical integration in engineering classes and intrinsic motivation, as well as the impact of student motivation and engagement on faculty motivation. We also noted that the open-ended nature of sociotechnical integration can cause stress and interfere with motivation in some students. In [13], we articulated some of the barriers and opportunities our team had discovered in the creation of a broadly applicable assignment to promote sociotechnical integration.

With this background in mind and a new opportunity to spend a semester at the University of Calgary in Alberta, Canada, I set out to study how macroethics and social justice are conceptualized and incorporated into teaching and research within two different departments: the Werklund School of Education and the Schulich School of Engineering. Given my background in primarily engineering contexts and in the United States, I wanted to understand first what similarities and difference I might observe among people trained in and affiliated with these two different specialty areas. I also sought to see how people conceptualized macroethics and social justice in the Canadian academic context compared to my prior experience in the United States.

In particular, this paper focuses on three of the questions from the semi-structured interviews to understand the two sub-cases of people affiliated with education and engineering:

1. How are “macroethics” and “social justice” conceptualized by the interviewees?
2. Do macroethics and social justice play a role in the interviewees’ teaching and/or research, and if so in what ways?
3. How do interviewees describe the impact of the local context (city, province, etc.) on their answers?

This paper can be thought of as a step toward understanding how macroethics and social justice can be more successfully integrated into engineering education. In order to develop this understanding, a key first step is better understanding the ways that these concepts are defined and incorporated, both inside and outside of engineering. This case study provides information about these definitions and uses within the relevant institutional context. Although the case study approach does not allow the results to be broadly generalizable, the information provided by interviewees about the impact of the local context can provide insight into what factors of this context are perceived to impact them, therefore suggesting possible ways such impacts may be felt elsewhere.

This paper is organized as follows. The next section describes the methodology, including the context for the study. Following that is the Findings section, which is organized according to the three research questions. Some discussion about similarities and differences is incorporated into the Findings. Finally, it concludes with insights that might lead to new research and teaching opportunities.

Methodology

Case study research is intended to focus on a single example or phenomenon ([14], [15]) and this paper is not intended to create generalizable information about Canada or the U.S. as a whole. However, it can still provide useful information, especially for situations where larger-scale quantitative research methodologies may not be able to explain “why” or capture perspectives from underrepresented groups. Slaton and Pawley describe the ways in which small-n qualitative research benefit engineering education research, saying that “We believe that small-n studies...may shed light on individual and collective experiences that are far more layered than conventional engineering educational research methodologies can acknowledge.” [16] (pp. 137-138). Case and Light [14] also describe strengths of the case study methodology that outweigh its most common critique (lack of generalizability), remarking on the value of the context-dependent knowledge generated.

Data for the analysis is drawn from semi-structured interviews with 17 faculty and postdocs involved in research and/or teaching at the University of Calgary during the Fall 2021 semester. Most interviews lasted approximately one hour, with a range from 30-90 minutes. Interviewees were invited to participate by email using the process approved by the Ethics Review Board at the University of Calgary. Potential interviewees were identified based on information at their web sites, university publications and events, and recommendations from other faculty and postdocs. In total, 37 invitations to interview were sent, resulting in a positive response rate of 46%.

Nine interviewees hold primary or secondary appointments in the Werklund School of Education and eight hold appointments in the Schulich School of Engineering. Table 1 lists the pseudonyms used by the interviewees by affiliation. Six of the interviewees identified as male and 11 as female. In some cases, interviewees selected their own pseudonyms, but others asked me to select one for them, which I did using an online pseudonym generator. Sixteen of the interviewees gave permission to quote them by pseudonym.

Table 1: Alphabetical list of pseudonyms used by interviewees affiliated with the School of Engineering and the School of Education. As they are quoted in the Findings section, interviewee affiliations “Edu” or “Eng” are added to help identify patterns.

School of Education (Edu)	School of Engineering (Eng)
Bradley	Alex
Catherine	Barb
Chelsea	Christina
Diana	Jane
Ella	Leo
Ivy	Tara
Lisa	Theodore
Sana	Zachary
Summer	

Due to continuing impacts of COVID-19, some interviewees opted for virtual interviews while others chose in-person interviews (following university safety protocols). In both cases, interviews were audio-recorded and then transcribed for analysis. Transcriptions were performed either by a professional transcription company or by Zoom's audio transcription capability, after which I checked all of them for accuracy and to remove identifying information. Filler words such as "like" and "uhm" were also removed for clarity. To help identify biases and potential data gaps, I wrote reflective notes after each interview. I also utilized these reflective notes to help identify bigger-picture themes related to the findings in this paper.

Human subjects ethics approval was obtained for the study according to the established processes at the University of Calgary. Occasionally, specific details from quotes are redacted to protect interviewee anonymity.

I used a qualitative research process inspired by grounded theory [17] with coding of the cleaned interview transcripts performed using the NVivo software. First, I coded the responses to each question in full. Then, I collected all of the responses by question and affiliation (Education and Engineering) and read through each interviewee's responses to each question, looking for categories that cut across responses and creating new descriptive subcodes [18] in NVivo. These subcodes then informed the writing of this paper by enabling pattern recognition. Since the primary goals of this paper are qualitative, I did not quantify codes or subcodes.

Findings

One of the questions in the semi-structured interview protocol was "What do the terms 'macroethics' and 'social justice' mean to you?" It is largely from responses to this question that I draw answers for this paper's first research question, which lays the foundation for understanding the rest of the findings.

Conceptualizations of Macroethics

Many interviewees were unfamiliar with the term "macroethics." Some of these deconstructed the word into "macro" and "ethics" to derive a definition, usually related to a bigger-picture concept of ethics. Leo's response was concisely representative of those who were unfamiliar with the term: "It sounds like larger scale considerations of what is the right thing to do."

Other interviewees had previously engaged with the term macroethics and provided some more nuanced definitions and examples. For example, Ivy (Edu) described it thus:

"I think macroethics is beyond the individual. I think it's a stance, an ethical orientation to larger issues beyond the individual, right, so the obligations of institutions, of corporations to a larger world, to matters of sustainability, to social justice, to redistributions of power. I think it calls for something different of the ways in which, not only the individual, but the social institutions that we create support themselves nationally and internationally."

Lisa's (Edu) definition of macroethics also centered around institutions:

“Well, I guess macroethics, that really talks about those ideologies that structure society and how they also structure educational institutions, science disciplines, other disciplines. So those macroethics, to me, are about what is valued in society based on those structures and how that places some people at either position to benefit or position to become more unserved based on those ideologies.”

Summer’s (Edu) description of macroethics noted that the legal system can illuminate a society’s macroethics.

“It’s how systems are envisioning what is an ethical practice. Or what is an ethical approach. And how these are being actually sanctioned, right? And sanctioned through a legal system for example...So in [redacted - Summer’s research area], I see how the disciplinary ethics becomes then institutionalized through legal systems...And therefore, who’s deserving of something and who is not? Who is deserving of access, who’s not?”

Like Ivy, Lisa, and Summer, most of the definitions of macroethics provided by the interviewees referred to systems and institutions, which is consistent with Herkert’s description quoted in the Introduction, i.e., that macroethics is related to “societal decisions” ([8], p. 374).

One discrepancy that arose among interview responses was whether macroethics are absolute or culturally situated. On one hand, Alex (Eng) – who explained that he wasn’t very familiar with the term – said that

“for me, ethics are ethics and they are applicable on a macro and micro scale. They should not be subject to where you apply them. They [are] not, shouldn’t be subject to the environment you are in. They shouldn’t be subject to the surrounding and they shouldn’t be subject to whom you are dealing with. Whether you’re dealing with colleagues, students, administration. Your ethics are your ethics. They define who you are and they are not subject of environment.”

On the other hand, Chelsea and Bradley both reflected on the cultural factors that may cause macroethics to vary in time and place. Bradley (Edu) said that “ethics is a tricky word because it depends, where do you take this, and ethics is also subjective and cultural. What is ethical now maybe wasn’t ethical, or was what was ethical some years ago may be unethical now...Ethics is culturally situated,” noting that this is particularly true for microethics. Chelsea (Edu) illustrated this cultural context by noting several examples such as social use of drugs, how women are treated, and animal welfare, all of which have varied historically by time and culture. On that final note, several interviewees mentioned that macroethics go beyond humans, noting especially the environment and animals as important considerations encompassed by the term.

Conceptualizations of Social Justice

The term “social justice” was more familiar to interviewees than “macroethics;” every interviewee provided a definition or an example or counterexample to illustrate their interpretation of the term. One key element that arose is a sense of action inherent in the term. For example, Ivy (Edu) said “For me, it’s imbued with action. It has very little to say about what one espouses and more so about how one acts and departs themselves.” These actions were usually

incorporated into a sense of driving change. Several examples of this change-seeking include these quotes by Barb, Diana, Lisa, and Sana.

- Barb (Eng): “Being able to actually see where the injustices are and being able to self-reflect of how your work, your thought processes, your biases are upholding the status quo of these injustices and being able to, for the future, being able to name, how we can make change and within the realm of equality.”
- Diana (Edu): “part of achieving social justice is constantly interrogating and questioning who do our systems serve? who did they leave out? what do we need to do to correct that imbalance or address that gap?”
- Lisa (Edu): “social justice is about seeking to change those structures so that people have more equitable and authentic access to any kind of opportunities, whether it’s learning, jobs, housing, healthcare, all of those things...”
- Sana (Edu): “we’re not just seeking to include the people, but we want to change the structure so that they become inclusive of other ways of doing science and valuing science and thinking about the bigger purposes of science...”

This concept of social justice as an action connects well to some of my team’s prior research findings. For example, some students interviewed in an engineering science course in Colorado held the perception of engineers as sociotechnical change agents [11], recognizing that the engineering profession holds power and that such power leads to obligation.

Note that in Diana’s, Lisa’s, and Sana’s explanations, systems and structures play a key role, which is similar to the concept of macroethics. Many of the definitions, including Barb’s and Diana’s, recognized that these systems and structures privileged some people above others. In another example considering both privilege and enacting change, Ella (Edu) defined social justice as

“the notion that society really isn’t just for everyone. It is constructed in a very hierarchical way that, that really is, whether intentionally or unintentionally, it sets us up to have winners and losers, and people whose interests are always met and people whose interests are never met and everything in between there. So just the sense then that in aligning ourselves to matters of social justice, we can begin to address those unequal hierarchies. We flatten them a little bit or a lot, depending on who’s willing.”

Tara (Eng) also addressed privilege in her social justice definition:

“When we talk about social justice, a lot of the time we forget that we are where we are not because how great we are, but because of the privileges we had, and there are people who are even better and more...smarter, more hardworking than us who had none of those privileges and could not get there. And what we want, if we want the country or society that realizes full potential, is to have an opportunity for all of them.”

Another noteworthy element of social justice definitions can be observed at the end of Tara’s quote: she motivated social justice at least in part by enabling a country or society to realize its

“full potential.” Leo (Eng) also included a societal motivation for social justice in his definition: “it’s important if you’re living in a democracy and we’re trying to do big things as a society. And do we have the right structures in place there to, I want to say simply accommodate, or say facilitate, to enable a more socially just solution to a variety of challenges?”

By contrast, some definitions focused more on individual or smaller group beneficiaries of social justice. Christina (Eng) said “so I will say that social justice beyond the fairness aspect will be also more about how to help and support the vulnerable group of the people from the society.” Catherine’s (Edu) definition also addressed particular groups; she noted that part of social justice included “working to redress some of the historical wrongs and oppressions that have been perpetuated against particular groups.” Several other interviewees referred to fairness in their responses, with some discrepancy between whether treating people fairly meant treating them *equally* or *equitably* (unequally based on circumstance).

This tension regarding who social justice is for – society as a whole, or certain groups or individuals – could certainly impact how it is received in academic and other environments, and therefore the likelihood that it is incorporated into teaching or research.

As in the macroethics case, some definitions suggested that social justice is context-dependent. For example, Chelsea (Edu) said “I think social justice is that...at that moment, to that moment in time, in a particular context, what is just enough for that particular time, but then maybe in 10 years it will be different.”

A sense of humanity also arose in a number of the definitions and examples. Ivy (Edu) summarized her macroethics and social justice definitions by saying

“When I talk about a macroethics, and it includes social justice, it includes that kind of stuff and orientation and just a deep respect and the ability to listen to someone and share with them, right? So, a humanity. That we face each other as human beings on this planet.”

Similarly, Catherine (Edu) mentioned the human experience: “there could be more of an attention to how diversity in human experience, etc. and positionality...” and Lisa (Edu) talked about enabling people to “bring their authentic selves.” Similarly to macroethics, several respondents also noted that their definitions of social justice included non-humans, the environment, and environmental justice.

Roles of Macroethics and Social Justice in Teaching and Research

Another question in the interview protocol was “Do macroethics and social justice play a role in your teaching or research, whether implicitly or explicitly? If so, please describe how.” When asked this question, all nine of the interviewees from Education answered yes, whereas three of the eight interviewees from Engineering said no or that they were unsure, though all three of these subsequently gave examples that suggest at least an implicit role. Ella’s (Edu) response suggested that the unanimous “yes” from Education would not be surprising to her:

“I would say that probably most of us in an education faculty, that’s what is behind what we’re doing. So we’re not looking to be thinking about practices and education that just

reify what's already there, but we're looking at to maybe do some disrupting of those social structures or those learning structures, so that things can change to be more equitable or equitably distributed.”

Her response also alludes to the structures element that was so often part of the macroethics or social justice definitions provided for the previous question. Bradley (Edu) noted that one of the principles of his research “is that everybody can learn [redacted – a field of study], and we also know that [redacted – the field of study] can become a filter to perpetrate social inequity so finding ways to teach [redacted – the field of study] that benefit all the students can contribute to reduce these gap of social inequity.”

Ivy (Edu) provided insight into how social justice promoting diversity can lead to better research when she said that “it's not just the individuals that come with diverse perspectives and diverse backgrounds and diverse abilities, it's the topics themselves require that diversity as a strength in order to understand the topic.”

Many of the Education faculty spoke of ways that they could make education more equitable for students in their classes. Ivy (Edu) spoke of framing courses in a way that was less focused on what students don't know (a deficit model) and instead reframing based on what students do know. Diana (Edu) spoke of students getting caught by academic bureaucracy and said that “if they [students] feel like a cog in the machine, well, we [faculty] are the machine. We can change that machine if we've got the appetite and the will to do it.” One of her examples was as simple as giving students an extra day to submit assignments when they need it.

Both Summer and Sana spoke of ways to create opportunities for students to apply what they are learning. Summer (Edu) said

“in my teaching, I tried to think of ways in which I create the opportunities for students to really enact what they are learning, so how can I really change the kind of pedagogy that actually sustained this kind of neoliberal work, colonial logic, right? So have things that is responsive to students' needs? Really encourage them to think in their own platforms, in their own context, in their own positionality. And ask them, how does that apply? Instead of me saying, this is how this applies to you. It's like, 'How does that apply to you? How do you see this expressions of these kinds of things in your own context?’”

Sana (Edu) pointed out that with many challenges for students around the globe, it may be that the teacher's role is to plant some seeds, but that in the moment “that's my struggle...is how do you approach it, knowing that people have a lot to deal with, and that teaching for that futuristic kind of vision for how our society should be, it's not necessarily a priority for them in the moment, right?”

There was less consensus on the Engineering side. Leo (Eng) expressed a feeling of “luxury” that he was able to consider macroethics and social justice in his work, saying that

“Everybody I know at any department anywhere in the world on the engineering side of the fence is the default assumption should be domain expertise, reductionism, cool innovations to technical problems, and that's their contribution. I'm not saying it's not valuable or anything else I'm saying that's the default, that's the mindset.”

The majority of the interviewees from Engineering (even those initially unsure) were able to make connections between macroethics and/or social justice and their teaching or research. On the research side, Zachary (Eng) also mentioned proposals related to the environment and climate change that consider impacts on communities, not only with the initial development but also in the longer term community acceptance of climate-related technologies. Alex (Eng) gave examples related to research ethics and reporting.

On the teaching side, some examples provided by Engineering faculty related to social justice and macroethics were related to how the course was delivered, while others were related to the course content. Tara (Eng) spoke of working to remove barriers to access during COVID, including the creation of learning communities in her class in which students could help each other. She said that the pandemic made it “easier to understand where these inequities [among students] are coming from.” Both Christina and Jane (Eng) spoke of incorporating sustainability concepts in courses with which they were familiar. Although Christina (Eng) did not explicitly mention ethics, he said that “my take on the sustainability, on its root is ethical choice, in my own interpretation.” Barb (Eng) pointed out that it’s not just the impacts of technologies, but also perhaps their absence that could be a social injustice: “we just need to slow down and make sure that we are considering all of these other aspects that our technology will intersect...they will intersect all areas of society and even in the absence of it not intersecting a piece of society that could be the social injustice.”

Of the faculty who were unsure or not incorporating macroethics or social justice into their teaching and research, three reasons provided were lack of time, lack of knowledge of how best to do so, and lack of perceived incentives. As an example of the academic incentive structure representing a possible barrier, Zachary (Eng) said

“To be honest, I think I’m interested to some extent to consider some of those broader things in my research, but again, I come back to sort of the nature of where I sit now in terms of [redacted] and I don’t see there being a value proposition, okay, in terms of the incentives I face, to really do that.”

Related to lack of knowledge, Tara (Eng) said “These are also very new concepts for me. So I’m trying to make a understanding of them. I’m still struggling with understanding and how to put them.”

It is perhaps noteworthy that these reasons – time, expertise, knowledge and incentives – also were cited by faculty working on social justice and sociotechnical thinking in Colorado as barriers to integration ([12], [19]). This suggests the possibility of a commonality that may cross borders. Among the barriers identified in my group’s previous work [13] were “Incorporating sociotechnical content which is not commonly considered a part of the engineering canon puts extra demands on faculty, including time and energy” ([13], p. 9) and concerns that students who have been taught to prioritize the technical may not see the sociotechnical assignment as “true” engineering and may therefore object. However, we also observed a number of opportunities, including “the possibility to shift students’ views of engineering to include sociotechnical work” ([13], p. 9) and “Instructor optimism and excitement to create meaningful new assignment(s) for impact their students’ views of engineering and abilities to engineer sociotechnically” ([13], p. 9).

Impact of the Local Context

Finally, to answer this paper's third research question, I asked interviewees to "Tell me about how the local context in which the University of Calgary is situated shapes your answers." Many interviewees from both Education and Engineering had similar responses to this question. One of the most common responses was related to the conservative nature of the province of Alberta, though there was a great deal of variation in how that conservative nature impacted their teaching and research. Catherine (Edu) said "I'm not characterizing Alberta as a totally conservative place, but at the same time, there is a fair amount of conservative discourse and thinking out there. And so social justice work in Alberta often feels pretty radical."

Interviewees from both Education and Engineering linked the conservatism to university funding cuts, which impact both their teaching and research. For example, Lisa (Edu) said

"you can see, with the [COVID-19] anti-masking protests and things like that, that there is an underlying conservatism that does affect what happens at the university because, for example, with all the budget cuts and everything, it's a conservative government so of course public education, other public services are going to be the first things to be slashed, and the social justice issue, obviously definitely would not be talked about at the provincial level..."

Summer (Edu) also addressed the impact of the conservative government on the university budget and ability to progress in various areas, saying

"But when you have your budget slashed, like we've had over this past two years, I don't think the university has a lot of bargaining power to change some of those [social-justice related] things. And they have to kind of come up with the measurement indicators that the government wanted, for example."

Note that the last part of Summer's quote alludes to incentives at the university level, not just individual faculty. In other words, in an environment of scarce funding the university may choose to prioritize metrics that it thinks are most likely to benefit its funding.

Perhaps related to the discussion on conservative politics and discourses, quite a few interviewees also discussed the history of extractive energy industry in the province. Christina (Eng) said that "I think the oil and gas industry is really dominating in many different aspects," including with respect to donations to the university. Bradley (Edu) said

"I think, due to the particular political landscape in Alberta, University of Calgary, of course, will be divided, or at least will be in an interesting position, especially with the oil and gas as one of the major industrial activities in Alberta, and then the connections to pollution and global warming."

Leo (Eng) gave a positive spin on how the energy economy and transition could be used to promote socially-just thinking, education, and research:

"One of the great things about being here is, certainly in this province and in this city, the need for diversification, need for figuring out how to continue to derive economic value

from a natural resource, while simultaneously not making other environmental problems worse, it can be done by the way, but it requires some social – it can be done technically, but it requires some social innovation as well, both finance through to energy justice and energy sovereignty and the number of things in between.”

Both the conservative lean of Alberta and the impact of the oil and gas industry were frequently cited as factors in university budget uncertainties, which then could also make enacting social justice more difficult in research and teaching. For example, Tara (Eng) told me that

“But if you go back to your initial question about social justice, this is absolutely not equitable and not just to ask the students to pay more and more so we can get tax breaks through the oil and gas companies. This is not equitable. This is not just. And it is not accessible, inclusive. We are excluding the students who don’t have the socioeconomics to go to university.”

Another local context element that was mentioned by many interviewees in both Engineering and Education was the area’s Indigenous people. The university had many events and initiatives related to Indigenous people during the Fall 2021 semester, and these were clearly noted by the interviewees. Bradley (Edu) said

“I also been reading and educating myself in and regarding First Nations and Métis issues...Perhaps something I’ve been learning in this local context is how does the systemic racism, nobody’s racist upfront, laws do not make any, well, almost, many laws actually do, but the current laws do not make it this explicit discrimination but they allow things to happen in practice.”

Ella (Edu) pointed to current events as promoting the social justice conversation around Indigenous people:

“I think that because we’ve got this diversity now, I think it’s just really allowing and making people much more open to talking about social justice, and in particular this past year or two years around Black Lives Matter and the discovery of graves of children in First Nations Reserves are close to the...residential schools. That’s really, I think people are finally starting to get it that this ... The unfairness, the institutional racism that people could never really see before.”

Barb (Eng) described the university’s official land acknowledgment statements and associated terminology, saying

“Some people may go into that terminology, too, you know, of ‘settler,’ of ‘treaty people,’ of ‘visitors,’ ...and just our gratitude of where we live and work and play, you know, it comes to a personal acknowledgement as well. So I think that that’s definitely a tradition of acknowledgments and I think that kind of does, it should, at some point mean something just other than just acknowledging the land.”

Limitations

A key limitation of this paper is its sole-authored nature, which makes it more difficult to identify and confront biases as could be done in a conversation among multiple researchers. I have tried to compensate for this limitation by including much of the original data (quotes from interviewees) in the paper so that readers can discern meaning themselves, as well as by acknowledging my own position as an engineering faculty member in the U.S. who has studied these concepts in other research projects.

In addition, the case study nature of the paper, while allowing deep interrogation of individuals, prevents it from being utilized to draw the generalizable knowledge that is often prioritized in engineering research. Specifically, it is impossible to know for sure how representative the 17 individuals I interviewed are of the schools of Engineering and Education. In fact, it is likely that individuals who are interested in the topics of macroethics and social justice would be more likely to accept an invitation to interview. That said, as mentioned in the “Methodology” section and as will be discussed below, small-n qualitative research addresses a gap in knowledge for which large-n research is ill-framed, meaning that papers like this one are an important part of the overall conversation.

Discussion and Conclusions

Universities have opportunities to help shape discourses around macroethics and social justice, but faculty must be aware of and interested in these concepts in order to integrate them into teaching and research. Understanding different perspectives of the meanings of the terms and how these meanings might impact inclusion of the topics into teaching and research is an important first step. In the cases studied, it appears that social justice may be the more familiar term, but it is also potentially more politicized, which could create a disincentive to its incorporation in locations where provincial (or state) incentives are perceived to be more conservative.

There appears to be a difference between the faculty and postdocs I interviewed from Education vs. Engineering in terms of their application of macroethical and social justice concepts into their teaching and research. Perhaps further research could investigate how widespread this difference is and its causes. For example, of the Science, Technology, Engineering, and Mathematics (STEM) fields, many of the Education researchers had experience in science, technology, and math, but few had worked in engineering specifically. Is there something different about engineering, for example its cultures of depoliticization and meritocracy [20], that makes it harder to incorporate social justice than the other STEM fields? Does the age at which students start to learn science, technology, and mathematics (often early in public school) vs. engineering (often not until university) impact teaching and learning opportunities? Or was this difference observed primarily a result of which interviewees agreed to participate in the study?

The timing to consider macroethics and social justice in academia is a significant opportunity. As diversity, equity, inclusion, and access efforts are being implemented at universities around both the U.S. and Canada, a better understanding of the systems and structures that impede these efforts could improve their chances of success. University, local, and regional conversations in these areas were mentioned by a number of interviewees, suggesting that faculty and postdocs

are paying attention and interested in them. The fact that even those engineering faculty who were initially unsure of whether they incorporated macroethics and social justice in their research or teaching still came up with examples of how they might do so suggests interest.

A further unexpected opportunity to macroethical and social justice incorporation into academic research and teaching is the growing awareness of challenges to teaching and learning caused by the COVID-19 pandemic, as was mentioned by several of the interviewees. Most faculty have had to re-think course delivery, both in terms of content and assessment but also in terms of access by students who are more likely to be remote. This re-thinking may support receptivity to innovations that can create social justice-driven change and raise awareness of macroethical barriers.

Beyond COVID-19, universities and individual faculty members are impacted by the contexts in which they are situated and the perceived incentive structures. The impacts of the oil and gas industry on the University of Calgary may resonate with faculty in many U.S. states with extractive industries, shifting whether and how they incorporate macroethics and social justice in their teaching and research. The faculty promotion and tenure process may differ in details from one university to the next, whether in Canada or the U.S., but most tenure-line faculty will likely recognize the finding highlighting the importance of aligning their research and teaching with university priorities as part of their efforts to achieve tenure and promotion.

Although the case study approach does not allow us to draw generalizable conclusions about engineering or education in Canada, it is noteworthy that many of the comments made by interviewees from Engineering were consistent with my prior research in academic engineering programs in the U.S., which in turn are consistent with other literature about engineering cultures and mindsets such as [1] and [9]. It is also noteworthy that faculty who identify as women were over-represented in my sample compared to typical engineering programs: 11 of 17 total and three of eight in the School of Engineering. Small-n, qualitative research methodologies such as case studies can be useful in understanding how members of underrepresented groups in engineering understand the field and its systems. Riley, Slaton, and Pawley specifically addressed the value of small-n, qualitative research for improving social justice and inclusion in engineering, writing that

“To understand people’s educational experiences at the intersection of many social categories, we must use methods specifically designed to examine the experiences of small numbers of people; after all, *small numbers of white women and people of color in engineering is what we have*. Qualitative methods that have at their heart the deep exploration of small numbers of stories are well suited to this sort of examination.” [21] (p. 348; emphasis original)

My team’s prior research has suggested that there are differences in the ways that students holding different gender identities think about social justice and sociotechnical thinking in engineering (e.g., [11], [22]). Therefore, a deeper understanding of the ways in which social justice and macroethics are understood by people with different gender identities in engineering and other fields such as presented in this paper can create a foundation to better connecting with diverse students on these important topics. In the longer term, I hope that this research will

contribute to a foundation for a more diverse and inclusive engineering experience for a variety of students, as well as better outcomes of engineering in society more broadly.

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