

A Collaborative Autoethnographic Dialog Exploring the Soul of Engineering Education

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Dr. Avneet Hira is an Assistant Professor in the Human-Centered Engineering Program at Boston College. She received her PhD in Engineering Education and MS in Aerospace Engineering from Purdue University, and BE in Aeronautical Engineering from Punjab Engineering College. Her scholarship is motivated by the fundamental question of how engineering and technology can support people in living well in an increasingly engineered world. Her research focuses on affordances of technology, humanistic design, and engineering epistemology to promote purpose and connection in engineering education. In her work, she partners with students and educators (middle school to undergraduate), youth and their families, community organizations, artisans, makers, designers, and technologists. Currently, she is part of a team setting up the Human-Centered Engineering program at Boston College.

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Introduction

Engineering education is an evolving field whose boundaries have been redefined for at least the last three decades (Borrego & Bernhard, 2011; Journal of Engineering Education, 2006; Jesiek, Newswander, & Borrego, 2009; National Research Council Board on Engineering Education, 1995). We have noticed attributes that we consider powerful and central to our experience as junior scholars in this rich, invigorating, interdisciplinary area of scholarship. As we traverse through our engineering education pathways, we find ourselves positioned to add to the ongoing dialogue of what the field comprises. In this paper, we articulate, and draw attention to our experience of the field as we have been exposed to, interrogated, and constructively become part of it. We articulate our conception of “the soul” of engineering education by means of collaborative autoethnographic dialogue. Collaborative autoethnographic dialogue is a qualitative method that allows researchers to explore their perspectives and experiences in relation to cultural and societal systems (Chang, Ngunjiri, & Hernandez, 2016). We use the metaphor of the soul to narrate our experiences in the field, a majority of which include experiences we shared being in the same engineering education PhD program. The metaphor of the soul serves as a vehicle to communicate our experiences, conceptions, hopes, fears, and aspirations. The soul is as much an idea felt, as it is a scholarship known through inquiry. We experienced this essence as it moved across individuals in our department, and believe it is felt further in the engineering education community. The soul fuels continuous evolution by creating tension and using it as energy to find purpose in our work.

Intention

Our intention is to share our experiences and prompt reflection from the engineering education community so that members continue to interrogate their scholarship as they intentionally engage in their research and teaching practices. We also hope to be able to provide space to struggle with the tension that the paradoxes of engineering education expose our hearts to, until the soul makes way for the transcendent love that helps make sense of the paradoxes we live in (Palmer, 1998). We believe that the ontological cannot be separated from the professional (Dall’Alba & Barnacle, 2007). We see value in being vulnerable and exposing our inner thoughts and feelings, sharing our experiences with the community. By exercising vulnerability and exploring the soul as we have experienced it, we invite others in our discipline to critically interrogate their experiences and their version of the soul for themselves, and for the discipline as a whole.

Approach

In three different, but related dialogues, we use the metaphor of sitting with tension as we hold paradoxes together (Palmer, 1998). We invoke Palmer's practice of sitting in tension with paradoxes because it helps conceptualize engineering education, which in itself represents the paradox between various paradigms of knowledge. Dualism as a theme has surfaced in liberal and humanistic discourses in engineering education. For example, Cech (2014) presents technical/social dualism as a pillar of the culture of disengagement in engineering education which prioritizes the technical over the social. Leydens and Lucena (2017) write about the technical-social dualism in engineering education and its adverse realizations. Engineering is socio-technical in nature i.e. there is no engineering that is solely technical, and by dichotomizing or picking a side we break up a complex conceptualization into one that is neither authentic nor realistic. By *sitting with tension* as a guiding metaphorical framework for this study, we attempt to break up the dualism that exposes itself in engineering education.

Our discussions in this paper are informed by our ontology or sense of being. Such explorations in ontology are not traditional to engineering. We bring in this construct from the liberal arts because of the lack of such a device in engineering scholarship. We discuss: 1) our conception of the soul of engineering education, 2) the values the soul has brought to our academic journeys, and 3) forward-looking speculation of the soul. In the first dialogue, we discuss what the soul of engineering education means to us by describing the tensions between clarity and dissonance, and surrender and rebellion. In the second dialogue, reflecting upon the values we believe the soul has brought to our academic journeys, we discuss the tension between camaraderie and self-authorship, and integration and separation. In the third dialogue, we explore the future of the soul and question it by exploring tensions between inquiring and accepting, and innovating and reproducing.

Methodology

We use collaborative autoethnography to articulate our conception of "the soul" of engineering education and the paradoxes we feel within the discipline. Through collaborative autoethnography we explore, interrogate, and communicate how we have been exposed to, interacted with, questioned, and constructively become a part of the field of engineering education. By collaboratively elaborating on the paradoxes we have been exposed to we can allow for alternative conceptualizations of understanding to exist, and for the discussion of these conceptualizations, their exploration, and unpacking to happen outside of dominant discourses. As the individuals feeling and reflecting on the soul of engineering education we are well situated to describe what we were sensing. Collaborative autoethnography naturally gives us the ability to place ourselves at the center of the exploration as we elaborate on our experiences.

We chose to use collaborative autoethnography because we excitedly latched onto a feeling, *the soul*, that seemed to adequately conceptualize a sensation we had been experiencing for years being part of an engineering education Ph.D. program and developing our scholarships, and only now were able to retrospectively, consciously sense and label. We felt an ‘aha’ moment as we realized calling this the soul felt most apropos. Through collaborative autoethnography we also leveraged “aha” moments or epiphanies that helped us better understand our own experiences and our ontology in engineering education. Autoethnography is well suited to investigate ephemeral, metaphorical spaces - areas of emotion, spirituality, embodiment, and self-consciousness (Ellis, 2004, p. 30-38; Sochacka, 2016). The soul of engineering education adequately captured this sensation that we had. Through ongoing dialogues about the soul, we found that the more we talked about this sensation, the more excited we felt about the value it held for our engineering education community of graduate students, faculty, and students. We felt that the soul was an important aspect of our engineering education. We decided to share this idea that we felt held value, both to our department and to our discipline.

Collaborative autoethnography also allowed us to preserve the autobiographical self-reflexivity we each strongly possess as we delved into exploring and interpreting the culture of engineering education we experienced (Chang et al., 2016). By being reflexive, the researcher becomes more transparent to themselves and readers (Hesse-Biber, 2007; Mejia, 2016). Capturing several individuals’ narratives and the shared representations of an individual’s experiences around a similar topic shows repeated themes, adding complexity and commonality to the study, enabling validation of claims (Brown, 2014). We continuously reflect, elaborate, and tweak our practices as researchers and educators based on these experiences in collaboration with others that assisted us in examining our ontological position. We also engage our past experiences in engineering, schooling, and living more broadly, in our reflections.

Additionally, the collaborative aspects of this methodology enable the multi-vocality, multi-subjectivity, and critical questioning of each other’s narratives (Chang et al., 2016), which in turn help expand and more finely conceptualize various paradoxes and aspects of the culture of engineering education. Multiple autoethnographers collaborating, questioning each other, and examining their own and each other’s data allows for complementarity and criticality of findings (Hernandez, Chang, & Ngunjiri, 2017; Chang et al., 2016). Furthermore, through intersubjectivity (subjectivity shared by different minds/individuals) and multivocality, the singularity of an individual’s experiences is tamed (Hernandez et al., 2017). Multiple voices distilling out the essence of an idea and sharing multiple experiences related to it, especially when the researchers all share some form of experience with the phenomena being discussed, increases the depth of a study and reduces singular bias by increasing the plethora of explications to the phenomena under study so that the explications are not one sided; the story is shared by a broader range of individuals (generalized).

Positionality

Héctor is a Ph.D. candidate in Purdue's Engineering Education program. During his time at Purdue, he has worked as a research assistant in the STRIDE lab, as a First-Year Engineering teaching assistant, and instructor of record. Héctor was born in México and immigrated to Miami, FL, at the age of four. He grew up in Miami and attended several community colleges and universities in Florida until he graduated with his BS in Computer Engineering from The University of Central Florida. Throughout most of his college education, he worked and always enjoyed teaching other students and work colleagues various topics. Héctor's family ingrained in him that education is a way to acquire freedom, independence, and stability. His lengthy tenure in college, his love of teaching others, and the time he could devote to actively engaging in subjects while taking one to three classes per semester contributed to the way he approaches teaching, engaging with students, and his research. At Purdue, he learned more about education and how people learn, putting the skills acquired during his prior years into practice as he taught others and subsequently questioned those practices to be an equitable instructor and researcher.

Avneet is an Assistant Professor in the Human-Centered Engineering Program at Boston College. She was a graduate student in Purdue's School of Engineering education from 2014 to 2018. After Purdue, she worked in the corporate sector at MathWorks for a year and a half. After that, she returned to academia, first as a Research Scientist at MIT, and then in her current role as an inaugural faculty member of a new undergraduate engineering program in a Jesuit Liberal Arts College. Avneet grew up in several cities in India and considers her father's military service and mother's work as an educator and social worker to have influenced her life's values. She believes that her time at Purdue significantly contributed to her journey into adulthood. Engaging in engineering education research and being part of the community provided her with frameworks to make sense of the world and challenge her beliefs and systems around her. While she was a graduate student, she was also a teaching assistant, an instructor of record, and a faculty apprentice for undergraduate and graduate courses. In addition, she was involved in global engineering education work via her membership in the Student Platform for Engineering Education Development (SPEED).

Both Héctor and Avneet met while pursuing their M.S. degrees in Electrical and Computer Engineering and Aerospace Engineering respectively at Purdue, where they came across the Engineering Education Ph.D. program. They crossed paths at events on campus before attending the same open house session for the Ph.D. program. Once they enrolled in the same program, they were part of the same cohort where they took many of the same classes, were part of the same project teams and reading groups, and eventually shared social circles. Through these shared experiences, they started talking about their experiences with the Ph.D. program, including similar observations and commonalities. Their similar prior experiences with

engineering (especially their prior M.S. degrees at Purdue) and the accompanying unease contributed to them interrogating their experiences further, which formed the seed for this work.

Scoping

We find it important to note that we write about the soul of engineering education as we have experienced it. Many of the experiences we reflect upon were shared experiences as part of the same cohort of Ph.D. students and transferred over from other engineering departments at the university after pursuing our M.S. degrees. It is an attempt at articulating feelings, some aligned, others disordered, that we have experienced over the years. At the same time, we believe that all communities have souls. We also believe that where it is a great privilege to attempt such an undertaking, it is also a great burden. Perhaps, this tension is a good initiation into the framing of the rest of this work. We use tensions as a device to manifest and present our experiences in words: To bring you on our journey articulating these tensions over three dialogs.

Relational Ethics

Relational concerns deal with how researchers protect the privacy of those implicated in studies (Ellis, Adams, and Bochner, 2011). We do not mention any names of individuals in this paper, however it is imperative to mention that we did not have any of these experiences in isolation from others. We were accompanied by colleagues, mentors, classmates, and friends in our experiences and their presence contributed to both the experiences and our takeaways from them. Our use of the metaphor of the soul to explain experiences felt is inherently linked to all those with whom our paths crossed. We believe that we engaged in this process with mutual respect for each other and the larger community we are a part of (Rodriguez, 2017). In some of the reflections we share in this paper, we refer to our “department.” It is pivotal to recognize that we are reflecting on our experience of being members of a department, and not commenting on the department’s structures and policies.

Method

We present our critical reflections and auto-interpretations as well as the co-authors’ interpretations of our personal experiences (Hughes & Pennington, 2017). First, we jointly came up with questions to meet the intention behind the study. These questions, along with the individual-level explorations we undertook to answer the broader research questions are:

RQ1: How is the soul of engineering education experienced?

Exploration: How have we experienced the soul of engineering education?

RQ2: How does the soul contribute to the journeys of individuals pursuing scholarship in engineering education?

Exploration: How has the soul contributed to our academic journeys?

RQ3: How does the soul contribute to the future of the field of engineering education?

Exploration: How do we believe the soul of engineering education will be experienced in the future?

We then jointly came up with the tensions that we experience in each of the explorations within the metaphor of the soul. We represented the explorations for RQ1 as tensions between clarity and dissonance, surrender and rebellion, and social and technical; that of RQ2 as between camaraderie and self-authorship, integration and separation, and conforming and contradicting; and that of RQ3 as humanist and utilitarian values, inquiring and accepting, and innovating and reproducing. We then jointly reflected upon the meaning of each of the tensions verbally and combined them in writing to form a discussion on each of the tensions. This explanation of each of the tensions is captured in the section below. We then individually reflected upon each of the tensions as explorations to answer the research questions and jointly analyzed our written reflective narratives. Excerpts from our written reflections are also captured below. During this exercise, we reduced the number of reported tensions in each research question from three to two because of overlaps between some constructs and limited reflective narratives in others. In a few places we refined our reflections for the final draft to better reflect the tension we were exploring, ensuring the essence of the idea was still communicated.

RQ1: How is the soul of engineering education experienced?

1.1. Disagreement ↔ Alignment

We experience the soul as a tension between disagreement and alignment. The soul causes confusion and at the same time allows us to be in alignment with the values of the larger community. Embracing the soul encompasses questioning and reexamining everything we know about engineering, about education, and about ourselves. Simultaneously, embracing the soul encourages alignment between ourselves and the outward facing values of the different engineering education communities that we are a part of. Discourses like “what counts as engineering knowledge,” “who gets to be called an engineer,” and “who has access to engineering,” throw us into dissonance by challenging what we fundamentally understand about engineering and our engineering identities. Simultaneously, entering into a new community requires us to align to the shared norms and values of the community, confirming our identities as engineering education community members. We simultaneously want to belong and to be our own persons. The soul is responsible for us yearning to understand something predefined and existing, and fight or innovate our way through or around it.

Proceeding through the degree program triggers disagreement and alignment, making us interrogate our past beliefs and experiences

Héctor: *Is our department tension? The department cultivates tension. Embodies it. The department is a space for the tension to exist. Our department, the discipline of engineering education, embodies the paradox of alignment and dissonance. But is it really a paradox? In conversations with other graduate students there were multiple opportunities to feel certain and uncertain. To explore the feeling of uncertainty alongside a sensation of previously held certainty from our previous experiences.*

Is the soul a paradox? Is the soul the ethos of our department? Is it the feeling of exploring tension? The soul is something our department has that they bring out in us (some of the grad students and faculty have it in different quantities, manifested in different ways). Then, they help us cultivate it.

Avneet: *Being in the program increasingly made me ask uncomfortable questions about access and opportunity, the purpose behind engineering, purposes it serves, the masculine nature of several engineering artifacts and experiences, the importance of qualitative data in understanding human experience. Though at the same time I was a graduate student in a department within the College of Engineering at an R1 university, conducting and planning research that needed to be pitched to traditional funding structures, going to conferences that were open to newcomers and yet had their own culture and ways of engaging. In these experiences I felt I was in some way aligning to new cultural norms as I tried to find a comfortable space in a community I wanted to feel that I belonged to.*

I believe that my initial belief of what engineering is came from my background in engineering and being a “high-achieving” high school and college student. I never quite interrogated the realities of what made my achievements possible.

1.2. Surrender ↔ Rebellion

The soul enables surrender and invokes rebellion. There was an aspect of “going with the flow” and “you’ll know when you know” as we grappled with our identities as Ph.D. students and junior scholars in the field. We found it to be ok to not know and to surrender to the warmth and comfort the community provides. At the same time, the soul invokes interrogation of concepts and rebellion against ideas that were previously labeled as known. The soul equips us to accept the things we struggle with. We breathe into the struggle and settle in, in order to fight back. The soul makes sitting in the tension less of a struggle. The community provides a space to sit through it. This uncomfortable practice focuses energy and fight.

Surrendering to the requirements of the degree program while rebelling against the traditional norms of engineering and the academy

Héctor: *The department made us do it!! The department made us question and inquire. I wanted to belong to the department. The department facilitated this questioning, then facilitated the DOing of something. The questioning was always in me too.*

Avneet: *However, even though we surrendered to the graduate system and milestones at the university, I also felt like the act of working on a PhD was rebellious in some way too – rebellious against how I had experienced engineering education in the classroom, in the communities that I was part of and not, in how I often felt the need to pretend to be “one of the boys,” to be privy to plans, conversations, projects.*

Héctor is energized by the process

Héctor: *[It’s energizing] To produce, to change, to question, explore, be pushed to question and think, and question others to think and be pushed back. Not violently though. Not like being interrogated. But through a gentle socialization of sitting in the tension alongside others who are also experiencing the soul. It is both disconcerting and energizing to explore my research. What is its relevance? Whom does it serve? What are the practical outcomes of this? How does it provide value to others and will it make me happy? I accept and let go of the struggle of doing exactly what I want and amalgamate my community into my research passions and curiosities.*

Avneet trusts the process

Avneet: *Something I remember from the times I or others were taking the readiness assessment (RA) or prelim exams in the PhD program, someone would always say “you’ll know when you’re ready.” In my experience this was true – I do think I knew when I was ready to both start exploring certain areas within the scholarship that I believe did justice to my areas of interest for the RA, and then to be able to prepare and defend (to some extent) my proposed research for the prelim.*

I remember this process being liberating and feeling like surrender at the same time.

RQ2: How does the soul contribute to the journeys of individuals pursuing scholarship in engineering education?

2.1. Camaraderie ↔ Self-authorship

The soul elicits camaraderie and projects self-authorship. The soul is part of a community, a community which nurtures, encourages, and takes pride in the soul. At the same time, the soul is its own being, full of dispositions, doubts, agendas, and purposes. Where multiple researchers

within a community have a shared sense of purpose guiding their work and academic journey, we also strive for and project our work externally. The soul necessitates and stimulates selfish, individual growth and development, and selfless participation in the academy. The soul helps us grow individually and in partnership with others.

Tension between belonging and untethering to develop our voice

Avneet: The camaraderie and relationships with others also provided a safe place to sit with the tensions, explore them, and find ways to be with them.

Likely one of the most positive impacts of the experience has been the opportunity to build camaraderie with others going through the same journey, but in their own ways. I found this feeling of belonging to a community where we all support each other and celebrate each other's achievements and be there when things are not going as well, to be at tension with the rugged individualism that self-authorship can sometimes demand. I had people to turn to, fellow graduate students, when I was running late on deadlines or was having trouble seeing the way through. Sometimes this happened organically, and at other times in spaces we had created to gather. We would gather over burgers and beer and share what was going on, listen to each other, and offer comfort.

Héctor: [As we wrote one of our first ASEE conference papers, the student co-authors and I] had something to say and we felt welcomed and powerful enough to take on writing a paper for the conference. [Members of my cohort] bolstered one another...I felt that my committee and many other members of our program embody the soul. My committee encouraged me to participate and use my voice in my writing.

Héctor feels uncomfortable being vulnerable in his writing.

Héctor: While the soul of our department (and my committee encourage me to examine myself, to explore, and to share these explorations with others) I still feel shy expressing myself. It's difficult to open up. I think I've been taught in my previous discipline (Electrical and Computer Engineering) that what I have to say doesn't belong in [an engineering] space. It's not technical or rigorous enough. I've wound up censoring my voice significantly. Counteracting that is still difficult.

Avneet feels responsible to her scholarship and approaches it strategically.

Avneet: An important aspect of being a scholar and I believe also part of the responsibility of a good PhD program, is developing self-authorship. What are the areas that I want to explore further? What are the areas that I am best positioned to study and make the most useful contributions to? These are some of the questions I had started thinking about more and more towards the end of the PhD program. Now, as a junior faculty member setting up my research

program, I think about these questions even more. It is important to me for my work to be meaningful for the people it engages. It is also important for me to use my power and privilege to impact my circles of influence in positive ways.

2.2. Dissonance ↔ Understanding

The soul is dissonant and the soul understands. The soul grows most through dissonance and feels best through understanding. Dissonance is essential to learning, and understanding is essential for living confidently. We would not be engineering education researchers if everything simply added up, if we didn't experience dissonance. We would be wandering souls, if we did not understand; understand how the world works and how things come to be. By sitting in tense, dichotomous, polarizing situations we gain greater understanding of the different parts of ourselves that do not always agree. By pulling ourselves apart we learn about ourselves.

Complementary relationship between dissonance and understanding as a way of being and knowing

Héctor: The Ph.D. curriculum was such that I was thrown into dissonance by my instructors and then asked to integrate these ideas into cogent arguments. I felt like the dialogue was often about dissonance and then understanding this dissonance into some productive context (pragmatism – we're still engineers after all). Even though sometimes I'd arrive at an integrated, linear, series of thoughts – a written statement, an idea that I stated verbally to others perhaps, there was still an unease and a discomfort with the finality of the integrated artifact. I kept myself in tension because I wasn't happy enough leaving it alone, just letting it be. The child-like dissenter in me, always questioning, interrupting, seeking to understand more, was alive and well. I knew that within this finalized, pragmatic, cemented forward-moving idea, there was still space for tension. I would question the final product. I knew someone would invariably ask for clarification.

Avneet: Dissonance and understanding are important on the path of learning. I used the term 'dissonance' when I took some independent study courses. New readings often made me push my thinking and caused dissonance. When I saw how what I had learned impacted the larger landscape, it led to moments of epiphanies. Experiencing dissonance is hard especially without a place to be vulnerable and make sense of things, and realize that there are things that can't be made sense of in the moment.

RQ3: How does the soul contribute to the future of the field of engineering education?

3.1. Inquire ↔ Accept

The soul inquires and the soul accepts. The soul picks its battles. The soul asks for what it wants, what is afforded to it and at other times rests and accepts. We find ourselves asking questions to make meaningful change in the world, and at the same time bring ourselves to accept that we

cannot change. Often what we want to change is not afforded to us, leading to dissonance. Nothing is ever enough. The soul, ourselves, and the academy can never be stagnant and complacent. We will always be inquiring, probing, wanting more. At the same time we surrender to and accept that we are finite. We appease ourselves and others and are true to ourselves in wanting more. We straddle doing and dreaming.

Resting in tension between comfort of acceptance and yearning for growth while feeling supported.

Héctor: Alongside this pursuit for more is also the recognition that you can't have it all. Sometimes for Ph.D. students, this could mean redefining a research question. Re-scoping a project. Re-imagining something. Even for faculty I'd venture to say that happens. Even as adults we have to accept that we sometimes bite off more than we can chew. In the space of engineering education though, part of what brought me to this field is the dissonance for wanting something more. I wanted more from my instructors, more from the journey of learning to be an engineer. I wanted to go under the hood of this enterprise. Along with learning the complexity of this job comes surrendering to my limitations, accepting them, and working alongside them. I think the soul of engineering education comprises this idea as well. Pushing for more, and ready to embrace and hold you when it's too much. Support you. It elicits resilience. Helps you get back up, dust yourself off, iterate and try again.

Avneet: The soul provides camaraderie to inquire, and the soul provides community to accept. For me personally, there is perhaps an element of growing up in experiencing this tension as well. I find myself asking as many if not more questions as compared to when I was younger, but I also find myself accepting more. I see my own trajectory of having moved from a 'rebel without a cause' to a 'let's consider all perspectives' kind of rational person. Maybe this isn't great, maybe it is. Perhaps the shared experience of the soul can help invigorate us and also be a [comforting] weighted blanket when needed.

Perhaps this feeling is fueled by narratives that one hears from multiple people over time, in conversations, in writing, in conference and meeting themes, in agendas and what not.

We can move forward while encouraging ourselves to question the status quo an infinite number of times, and at the same time know that we will accumulate knowledge and ideas, which might serve as the basis for new work.

3.2. Innovation ↔ Reproduction

The soul innovates and the soul reproduces. We build and deploy. We use and reproduce. We change and leave alone. The unstable, insatiable, complex, uncompromising parts of ourselves take and give. We are capable of so much. As we move forward the tension in ourselves serves to innovate and reproduce, to be happy with what we have and want more, and be able to feel all

these things at once. The soul changes, but remains the same. The soul goes places, sometimes it goes by itself, it changes and remains the same. It changes to achieve relevance, it remains the same to celebrate its glory. Products from our discipline go places and take some of the soul with them. The soul merges and battles with other souls. Some of it remains and some of it gets lost forever. We are not satisfied with what we have and think we can do more. In doing more, in doing something else, we will again make something that is insufficient. That is ok. We will continue to innovate, and so will others after us. And they will reproduce what's there, and that is fine too.

Restless energy of the soul, inching towards evolution

Héctor: Sometimes it's not tension, it's restlessness. What's the difference between the two? Regardless of differences, I think they can both serve as sources of energy and drive ... In this entire dialogue, restlessness seems to be a theme; the idea that what we have is insufficient. The soul is restless. In that restlessness we seek to innovate and we end up reproducing some things. Changing and evolving oneself is a difficult and worthwhile endeavor that involves constant restlessness. Constantly reproducing and innovating – changing things for others, for oneself, hopefully in a net positive direction. ... We keep evolving. Innovating. Always changing, forever. And hopefully nip some problematic tendencies in the bud.

Avneet: It's important for the soul, in its own distinct and situated nature, to reproduce. It is also important for the product of the soul, the research, interventions, and writing, at least when relevant, to reproduce. Though if the soul reproduces itself as is, is it really the soul? Isn't it important for the community and the place to create it and have unique experiences with it? Recognize the tensions and sit with them in discomfort and comfort?

Héctor is concerned about reproducing old patterns in engineering education

Héctor: The more things change, the more they stay the same. In my studies and reflections about myself, as an engineer, as a man, I've realized that I reproduce certain injustices/inequities/problematic behaviors. We'll take some concrete examples: I deepen my voice as a survival mechanism when I start addressing my students during lecture. I'm trying to present a strong male persona. I don't want my gay sexual orientation to threaten their perception of me as a competent engineering instructor. Another example: Engineering was a struggle for me. It was difficult. Professors didn't always make things easy. Engineering as a subject itself is incredibly challenging, let alone the time constraints in which we're supposed to perform. I justify the difficulty to myself and to others and I'm sure to some extent recreate it now that I'm in the driver's seat as an instructor.

I do not like perpetuating or recreating behaviors or traits I disagree with. The constant re-examination of my identities and my positionality (especially through papers like this one)

leads at first to a negative judgement of myself and admonishment. "Come on. I should be able to do better. I know better," I tell myself. But I am a product of my society. After the pity party, I think about what I want to do about my disagreeable behavior.

If we don't innovate, will we perish?

Avneet: Representing the unquenched thirst of its bearers, the soul demands innovation. If we do not innovate, the soul would perhaps lie dormant. The reason the field exists is because people wanted to innovate on the status quo, make life better. Resting in the status quo or reproducing the same patterns, I believe, would be antithetical to the motivation behind the creation of the soul. If we don't innovate, someone else will. When this happens, does one soul extinguish and another ignite?

Discussion

We experience the soul of engineering education as tension between disagreement and alignment, and between surrender and rebellion. Proceeding through our journeys in the field of engineering education triggers disagreement and alignment, making us interrogate our past beliefs and experiences. The soul of engineering education helps us surrender to the requirements of the degree program while also rebelling against the traditional norms of engineering and the academy. This energizing process happens in community and requires trust - trust in ourselves, in our colleagues, and peers.

We experience the soul's contribution to our academic journeys as tension between camaraderie and self-authorship, and between dissonance and understanding. There is tension between belonging and blooming as individual writers and scholars. The process of exercising our voices and the vulnerability involved can be uncomfortable. However, we feel a responsibility to speak up in our scholarship. The development of our scholarly voice is in part based on our perceived needs of the community.

We believe that we will experience the soul of engineering education in the future as tension between inquiring and accepting, and between innovating and reproducing. The complementary relationship between dissonance and understanding can be a way of being and knowing. The soul supports us as we rest in tension between the comfort of acceptance and yearning for growth. The soul is restless and evolves slowly. At times we are concerned that certain privileges facilitate the reproduction of old, detrimental patterns in engineering education. However, we have no choice but to innovate. If we don't innovate we will perish.

Closure

In this paper two junior scholars attempt to communicate their ongoing traversal through the evolving field of engineering education by using the metaphor of a soul. They leverage

collaborative autoethnographic dialogue to sit within various tensions inherent to their experiences of the discipline. As they elaborate and interrogate their experiences through scholarly inquiry, they hope to communicate the essence of an idea felt throughout their engineering education scholarly journeys. This felt idea, this soul, continuously evolves and creates energy through tension.

We, the authors, are constantly in tension. The soul of engineering education is always in flux. We felt the soul in ourselves and in our experiences. It is mutually constructed and destroyed all the time. It is the source of constant consternation which propels us forward. What are your tensions? What is your *soul*? Where are you going and how do you serve yourself and others to get there? How do you reproduce, push back, move, sit, surrender and innovate?¹

Within our experiences at large in engineering education, starting with our experiences in our department, we have found a place that nurtures tensions. We journey through our pathways alongside community members who also feel tensions and are willing to practice exploring, communicating, recirculating, and interrogating them. We exhibit our sense of being through collaborative explorations that help us better understand our own experiences. This practice of vulnerability, sharing our experiences and ideas, is an attempt to translate into words something that we feel in our discipline. We invite you, the reader, to practice sitting in uncomfortable tension between paradoxes. We offer our reflections to you and thank you for joining us on our exploration of the soul of engineering education.

¹ We want to acknowledge that different words will invoke different meanings for people, especially a word such as “soul.” One of the reviewers’ comments about the use of the word “soul” helps explain this ambiguity that might be informed by one’s cultural and religious upbringing: “I was wrestling with the term “soul” throughout the paper and this sentence and paragraph helped me understand my discomfort with it. I felt like the word “spirit” here would make it clearer to me since it would help explain why it comes and goes (is “mutually constructed and destroyed all the time”). Spirit gives me a sense of the ephemeral and otherworldly, while soul also gives me a sense of permanence and essentialness that will persist once the “body” is gone. Maybe it’s just my Judeo-Christian cultural upbringing and limited exposure to Eastern and/or Indigenous spiritual traditions or other conceptions of soul that make this harder for me. If you are understanding the soul differently (less as an individual essence and more as a collective emanation), perhaps you could add something in the paper (Intro and Positionality sections maybe) to help us understand?”

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