

Storytelling in Engineering as a Justice-centered Methodology

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I recently completed my PhD in Engineering, where my work brings light to the normative cultures of engineering education. By applying hierarchical dualisms (e.g. man-woman, mind-body, rational-emotional, culture-nature, technical-social, etc.), I aimed to increase the critical consciousness of engineering education and bring awareness to these normative value systems. This paper provides a story of how storytelling methodology saved my sanity, improved my research, and led to greater outcomes. Much of the words in the paper are adapted from Chapter 3 of my dissertation (Paul, 2024).

Prologue: Context

Writing a PhD thesis is a daunting task filled with trepidation, uncertainty, and anxiety. After years of research, reading, data collection, and analysis, somehow this information is to be presented into a coherent sequence of scholarships that demonstrates enough ‘rigour’ (Riley, 2017) to be worth a doctorate.

My PhD research journey had unfolded, weaved, and taken unexpected pathways, leaving me with what felt like a mess that had severed itself from my original objectives. So three and a half years into my PhD journey, around the winter solstice of 2022, I sat with my supervisors and a stack of over 20 post-it notes, each with words describing the work I had done and published—the “academic capitalism” in which I had participated (Slaughter & Leslie, 2001). We organized them into a line. There in front of us, we had made connections between my messy and disconnected activities to create a story. Figure 1a below shows these post-it notes, as well as an image (1b) from a conference presentation where I told a further ‘tidied’ version of my thesis story—a series of pedagogical implementations, ranging from small 15-minute mental wellness modules to a full 4-year sustainable systems engineering program.

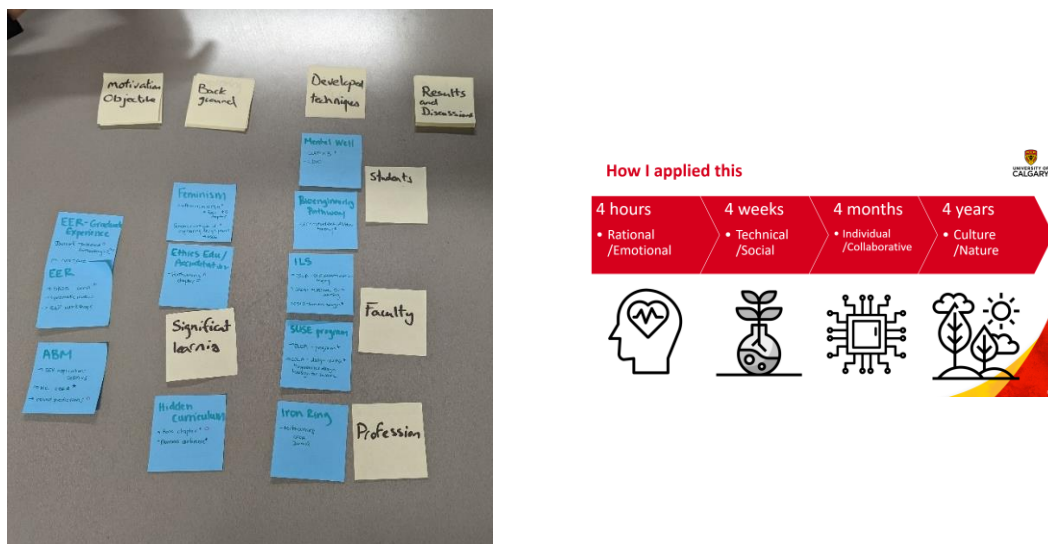


Figure 1. Early renditions of my thesis structure.

- 1a. The left photo showing the initial brainstorm and structure
- 1b. The right photo is from a conference presentation, showing a cohesive structure moving linearly from small to large cultural change in engineering.

I began trying to write this story, but it felt “dispassionate, [...] lacking in darkness, in surprises and, above all, in ambiguity” (Kociatkiewicz & Kostera, 2023, p. 3). I struggled to take the work I had done—work that was full of complexities, pushing boundaries, redefining paradigms, and the richness of human experiences—and write it up based on the simplified, linear sequence demanded in academia. It was not just about the aesthetic structure (introduction, literature, methods, results, discussions, etc.), it was how this dominant dissertation rhetoric silenced the true ambivalence and complexities of my findings. This traditional style and structure focused on knowledge production more than depth of holistic understanding (Kociatkiewicz & Kostera, 2023). I relate to this reflection from another PhD student as she considered this same challenge:

“How could I condense my research into a series of neatly defined chapters? I was attempting to follow the normative pattern of a conventional thesis [...] It seems ordered and elegant; a neatly bounded object that represents your competency. I knew I was a competent and clever doctoral student, but still my research did not look like that neat and tidy output. My research was messy, it was emotional, and it was not an easily divisible and logical process.” (Weatherall, 2019, p. 101)

I itched to do something different in how I presented my work. I even planned to do a cross-stitch representation of each chapter at one point, buying cross-stitching supplies and everything. They never made it out of the package. I was drowning, trying to fit my non-traditional work into the traditional box of engineering research. By trying to emphasize the rational, apolitical, and mechanistic elements of my research, I was being cut off from myself, my expression, and my way of being. And this “‘writing out’ of the researcher from the doctoral thesis leaves us with an image of an objective, white, male, straight researcher” with an emphasis on “the ‘logical’ phenomena in a situation, rather than the queer or the irrational” (Weatherall, 2019, p. 108). Because me and my research are deeply emotional, critical, and holistic, I was being separated from my own femininity and queerness, as well as that of my research.

A few months later in the early spring, the weight of this separation wore on me too deeply, and I took a short mental health leave. I needed time to reconnect with my inner self, to heal my being, and to heal my heart. I needed to lean into all my messiness, emotionality, and uncertainty that made me an amazing engineering researcher.

When my heart and soul were ready to write again, I initially started with following the traditional structures. By now, I had developed more confidence in my paradigm, so I recognized that these structured and “masculine styles of writing were marginalising other ways of being” (Weatherall, 2019, p. 105). My writing style and flow had to align with the paradigm of my research, so I slowly broke free of the traditional structure and embraced what Pullen and Rhodes (2008) call ‘dirty writing.’ In their description of dirty writing, they emphasize the boundaries and dualisms that structure our thinking and writing (including self/other, script/improvisation,

object/subject, clean/dirty), and how structure and order intentionally prioritize ‘clean’ writing, which is only based on “arbitrary conditions” of what it means to be dirty or messy (p.250).

Inspired by my queer identity and queer theorists, I was disrupting conventional approaches to engineering writing that seemed natural and necessary (McDonald, 2017). I recognize that by doing this, I was going against the readers’ expectations, and leaving in some “aspects of text creation that are usually tidied away before publication” (Kociatkiewicz & Kostera, 2023, p. 2). This may have made readers of my thesis (and perhaps even this paper) feel uncomfortable as the dominant knowledge structures they are used to seeing were absent, and other knowledge structures were being given agency and prominence. This was an intentional choice: “Queering writing is about challenging and disrupting hegemonic styles of structures of writing to unsettle the reader and writer into thinking differently” (Weatherall, 2019, p. 108). Breaking down dominant norms, boundaries, and dualisms allows us, together as writer and reader, to explore less structure and more fluid and dynamic research aims.

But, I couldn't do this alone. I was fortunate to have found friends and colleagues in engineering education from around the country who connected with me on my thesis writing. After all, writing “is not conducted in some state of romantic individualism, in which a doctoral thesis appears after locking oneself in an office, alone, for several months” (even if that is what I had planned for myself) (Weatherall, 2019, p. 105). Writing occurs through a network of reciprocal and interpersonal relationships that influence the words, the motivations, and the results. These friends, as well as my supervisors, supported me in transcending the normative structures of ‘quality’ engineering writing. They supported me in going beyond the ‘malestream’ of engineering to express “what was previously inexpressible, unknowable as well as unresearched” (Kociatkiewicz & Kostera, 2023, p. 14).

The best example of this is how for the final three months of writing I scheduled virtual ‘accountability meetings’ with colleagues and friends who were also writing or studying. At the beginning of the meeting, we spoke for a few minutes and told each other our 30-minute writing goal. We then turned off our camera and audio, checking in with each other again at the predetermined time, and repeating the process for as long as we had available to write together. Writing a PhD thesis (especially on social justice in engineering) can be one of the most isolating tasks of graduate school and somehow, I turned it into the most community-based three months of my degree. Every few paragraphs, I got to talk to others doing similar research about what I was doing, I heard about what they were doing, the challenges they had had, and we gave feedback and encouragement to each other. The learnings were often interconnected and the theoretical foundations of my thesis significantly transformed from these reciprocities. Writing groups such as these have been shown to create a “community of discursive social practice” that supports peer learning and peer review (Maher et al., 2008, p. 263). Through this process of collective learning via dialogue and relationships, I explored and built on greater complexities and theories in my final thesis than I would have been able to achieve as an individual. But it went beyond the theories, I also gained confidence in being able to do this paradigm shifting work with others—in knowing that, regardless of the pushback and the number of uphill battles I had to fight, that I wasn’t alone in this work.

And an amazing thing happened: I began to learn *through* writing. I never realized that the thesis wasn't simply a summary and output of work, but was "a formative learning process through which a doctoral student learns what it means to be a researcher" (Weatherall, 2019, p. 101). My writing process was part of the research, it was changing my worldviews and shifting the purpose of my work. I was not simply part of a production factory, a worker without agency producing for the institution as I had been throughout my formative education. I was in relation with my thesis, growing together with her, and holding each other accountable to our goals (see more in Tynan's paper on "Thesis as kin: living in relationality with research" (2020)).

It is important to note that no one writing style is better or worse—rather, there should be an emphasis on the choice of expression to suit the message, the paradigm, and the audience. This gives agency in choice between scientific methods, storytelling, poetry, or many other mediums, with no one medium being 'better' than the other. It is still essential to also have criteria of quality, and thus, this choice is not just about style, but it is also about alignment with epistemology, ontology, and axiology of the research and researcher. Thus, in the engineering social justice and peace division, I encourage us to consider the way that we write to align with our values and motives. In this paper, I start with this story, and in the next section I weave in traditional scientific writing about storytelling, to allow for different purposes and contexts.

In the process of reading this paper, you might experience moments where the writing feels 'incoherent,' and we must remind ourselves that "incoherence is inevitable when attempting to move beyond the established discourse" and often incoherence is more about not conforming to the dominant patriarchal expectations (Kociatkiewicz & Kostera, 2023, p. 3). So, if you feel yourself lost in certain sections, critically consider: what types of knowledges and findings are you privileging and why?

My thesis and this paper are not perfect, but rather my writing sometimes intentionally avoids perfection and conclusiveness. Instead, it emphasizes the "mess and uncertainty of doctoral work and how theories and methods get dropped out, left behind and picked up in 'irrational' and non-linear ways" (Weatherall, 2019, p. 108).

Interlude: Storytelling

Traditionally, engineering and science discoveries are told through language that does not provide the underlying motivations to understand why researchers are doing their research (Gough, 2006). As a researcher and in this paper, I believe that it is important that, as the storyteller, I can form a relationship with you, the reader (or story listener). Through stories, I personalized my thesis and this paper in a way that you internalize the experiences and content in the same way that I have. Through this process, it is important to remember that knowledge is not individually owned, but rather exists in the relationships of this research. Sean Wilson describes this at the beginning of his book:

"While I may be the one who is the storyteller for my book, the knowledge that I present does not belong to me or even to the amalgamation of us friends who

participated in the research. The knowledge is part of the relationships between us and cannot be owned.” (Wilson, 2008, p. 121)

What is Storytelling

Some philosophers and psychologists have “argued that stories are a primary, or even the only form of understanding open to us as human beings” (Kociatkiewicz & Kostera, 2023, p. 11). Stories are central to understanding our world, to making sense of our lives and identities, to planning for our futures, and to engaging in relationships, understandings, and creations with each other (Woodiwiss, 2017). Stories are therefore essential to engineering: we cannot design without understanding the stories of who we are designing for, our own stories of why we are designing, and the stories of all the designs that have already been created, human and non-human. These stories must be told and heard with humility, understanding that knowledge is not owned nor ranked in importance, rather, through stories we can share “some of [our] relationships, revealing some of the connections that make up” our theories (Wilson, 2008, p. 134).

Storytelling as a Method

Although stories are often presented linearly as a sequence of events, a climax, and a reflection that leads to an epiphany, a story is something we revisit regularly to reinterpret, re-contextualize, and construct in different ways (Woodiwiss, 2017). I learned this through engaging in the process of storytelling as a method. When I first began writing the stories for my thesis, I had said to myself, “the stories will be the easy sections, they shouldn't take too long”. Before sitting down to write my first story, I had estimated the process would take 90 minutes—eight hours later I finally had a first draft. After my draft was reviewed by a few others who provided input on their interpretations of my story, there was another four hours of revising, reinterpreting, and rewriting. However, this process is what helped me understand storytelling as a method. I was learning more about my research and my findings through writing my stories than I had learned through some of the more ‘technical’ elements of my research.

Through storytelling, we can synthesize our research and understand our outcomes with an understanding that “different framings lead to different insights” (Kociatkiewicz & Kostera, 2023, p. 9). The stories I have chosen to tell across my thesis directly impact the results and outcomes of this doctoral research. Although storytelling appears very personal and often includes many personal details of our lives, it is also “a political one, informed or constrained by the context in which we construct those stories” (Woodiwiss, 2017, p. 20). Using storytelling as a method for my thesis was a political choice just as much as an epistemological and personal choice.

Storytelling Suitability in Engineering Justice Work

When choosing to tell the story of research, we must choose “the right way of telling one's research” (Kociatkiewicz & Kostera, 2023, p. 8). Given engineering justice work applies praxis

and critical theory paradigms, storytelling applies as it allows for iterative cycles (theory), participatory relationship building (action), and leveraging of personal stories (reflection) in a way that aims to improve the reality of the participants (Wilson, 2008). Additionally, stories allow for commentary on “the emotional impact that my research had on me, as well as my understanding of the theoretical material” (Weatherall, 2019, p. 109), which aligns well justice work that aims to leverage the unheard voices and experiences of communities.

Storytelling as a method pushes beyond the traditional Western conceptions of researcher (Wilson, 2008), which has been a long process for me. Since being a young child, I have been ingrained in the scientific method (I won gold at the national science fair when I was in grade 7, and volunteered as a judge for over a decade). Although I do not claim to apply Indigenous research paradigms, through this work I aim to be continuously aware of my colonial mindset and push myself to expand the traditional ways of thinking, such as the scientific method. It is not to say that the scientific method does not have a place in engineering justice research, but that storytelling allowed me to expand my understanding of the scientific method, and therefore expand the boundaries of possibilities of my critical research. Robin Wall Kimmerer (2013) does this beautifully in the way that she weaves together three different ways of knowing through her book: Indigenous wisdom, scientific knowledge, and the teachings of the plants.

Storytelling Quality and Rigour

Storytelling as a method is not simply about telling stories. Rather it is essential that the method is applied in a way that is embedded with quality and “rigour” (Riley, 2017) towards the underlying foundations and rationale for storytelling in the first place. Stories must not conflate fiction and non-fiction, where stories are told through the research “to show them as truthful, reliable, and a result of rigorous study” (Kociatkiewicz & Kostera, 2023, p. 12). They must have a purpose within the research process, which can include coalescing past relationships and dialogues, wrestling current tensions, or applying insights to envision future possibilities.

Stories are built for a specific context, and within the method there is a responsibility of the storyteller to understand how, when, and where to tell the stories: “We therefore tell different stories at different times and for different reasons” (Woodiwiss, 2017, p. 17). There is an obligation for me, as the storyteller, to know what the reader is ready to take in, not in a way of judgement, but simply in awareness (Wilson, 2008). There is an active choice in the stories that are being told and the way in which they are told. Sean Wilson describes:

“Accountability is built into the relationships that are formed in storytelling ... I am responsible for who I share information with, as well as for ensuring that it is shared in an appropriate way, at the right place and time.” (Wilson, 2008, p. 126)

As a method within my thesis specifically, through multiple iterations, I was able to understand how my stories needed to be told differently. This process, in itself is not simply about me changing the story—based on relationships and dialogue, I was revisiting and reinterpreting the context of my stories and the identities and insights I wanted to portray (Woodiwiss, 2017). Sometimes my stories were even embedded with contradictions, however, “we should not see

such contradictions as an indication of untruths, falsehoods or misrememberings, but rather as a reflection of [the] various and competing reasons for telling a story and the constraints on such tellings” (Woodiwiss, 2017, p. 25).

Stories Both Liberate and Constrain

Stories are essential as they allow the “emergence of hitherto suppressed voices—the untold stories that cannot be made heard in other presentational regime” (Kociatkiewicz & Kostera, 2023, p. 9). Stories allow us to make sense of our world, and when we only have stories that adhere to the dominant narrative, this “render[s] personal experiences irrelevant” (Woodiwiss, 2017, p. 24). When underrepresented groups apply dominant narratives to attempt to make sense of their lives, this often constrains their possibilities. Often, when engaging in dialogue with colleagues or workshop participants about my engineering justice research work, there has been a sense of appreciation for giving them a framework and a different narrative that better described their personal experiences. In this way, stories can be liberating.

However, each story that is told privileges one perspective and enables that story to be told, while simultaneously prohibiting the telling of a different story. As the storytellers, we must be aware of who might be advantaged and who might be disadvantaged within our stories. This is why feminist methodologies emphasize storytelling, as it is a way to counter the dominant narratives and acknowledge the many ways of a telling about a subject (Woodiwiss, 2017). For this reason, stories must go beyond simply telling of the story and must also consider they why behind the stories, the ways the story may be constrained, the silences not told within the story, and the implications of the story itself.

Stories are Incomplete

Stories are built from relationships; they are webs of knowledge that come together through dialogue, which take the storyteller and the listener to another place. This is the power of stories, but also can be a challenge of storytelling and relational research:

“If I tell you about what we [Wilson and an Elder] were talking about when I was doing this research, will you make the same intuitive leaps that I did? I cannot be sure of this. On the other hand, if I just tell you where I ended up with my ideas, will you be confused about how I got there? There is no real way for me to tell whether you are ready to receive this information.” (Wilson, 2008, p. 71)

A story that is static, such as any story that is written as part of a conference proceeding, is “stripped of its dynamism and its fluidity and confined to a singular context” (Simpson, 2004, p. 381). The written story loses its relationships and personalization, and becomes contextualized in a way that prioritizes Western ways of thinking. These static stories are only partial, based on the context of the written word, who the storyteller is writing for, and what we want them to hear. In the context of my thesis for example, my stories were written under the assumption that they will be judged towards the completion of my PhD in engineering. Regardless of their incomplete

nature, stories are “frameworks which help or direct us to construct our own albeit limited and partial narratives” which allow us to “make sense of events, experiences or even whole lifetimes” (Woodiwiss, 2017, p. 25).

So, as you read this paper and my stories within, I hope that I have upheld my accountability and responsibility to you, that you are able to engage in relationship with me through my stories, and that they give you insights into your own life experiences and personal narratives. Thus, I now leave the responsibility on you, as the listener, to learn about engineering through the stories of this paper:

“For the storyteller to explain too much is not honouring you as the listener. [...] It is your responsibility as a listener to learn and to grow, as you too are accountable to all our relations.” (Wilson, 2008, p. 135)

Epilogue: Reflections

My PhD wasn't always easy. There were moments where my work was critiqued, where it was not considered 'engineering' enough. While speaking about my PhD research to different audiences, I often get the question along the lines of “how did you persevere through the challenging moments?” And my answer is always simple: a community of people who champion me. I didn't write this thesis alone, and through understanding the value of storytelling and of learning through relationships, I truly began to understand the importance of my community of supporters. And I continue to rely on this support, because finishing my PhD and moving onto the next phase of my role as a researcher and an academic continues to be terrifying. Because it hasn't been easy. In my first two semesters in a tenure-stream Assistant Professor role doing engineering justice education and research, I've already had multiple hardships, critiques, and falls. But I've also had many people lighting the way for me, cheering me along, and walking along beside me.

For example, when I was getting bulldozed over with unreasonable requests by leadership due to my junior status, at least three other women faculty told me they would advocate for me if needed. This small act of saying, “Hey, I'm on your team, we're in this together” was such a meaningful and powerful way to encourage me. It's a lesson I've applied to my first two semesters of teaching as well. I exist in a position of hierarchy with my students, and my hope is to embody social justice theories in the way I interact with them, to help them know I'm on their team too. I want my students, my colleagues, and my superiors to truly believe that I see knowledge as reciprocal and as existing within relation and stories. It is through our connections that we learn and can make change happen. In a conversation just last week with a potential summer research student, they said to me (paraphrased), “It's amazing to see the way you work. You talk about all this social justice stuff, but you also embody it in everything you do. Even though we just met, somehow you just make me feel so comfortable and valued.” This is the greatest complement I could receive, but it also scares me. I am terrified as I progress into my second year as a faculty member and as I become deeper enculturated into the institution. I feel myself starting to be more jaded, where I stop seeing students as individuals with stories, and every so often I catch myself seeing them as lazy complainers trying to beg for a good grade. I

feel myself spending too much energy on “academic capitalism” (Slaughter & Leslie, 2001) instead of taking meaningful action for change. So, although this student gave me a wonderful complement, I cannot forget that when we are fighting for paradigm shifting work, we have to continuously be vigilant. This is a skill I could easily lose, and, if I did lose it, no one would tell me. Because then I would just be the norm, I would exist within the dominant and expected hierarchy of academia.

In the end, my PhD research truly changed me in ways that I did not expect, and in ways that continue to influence me. Who I become or what path I am able to follow next feels like a huge unknown. But I just remind myself—put one foot in front of the other, keep moving forward and make sure you have others walking along the path with you.

I close with the final paragraph of my four-page acknowledgement section. As a reminder to any graduate student who might be struggling, feeling lost, or looking for advice on what to do next:

Lastly, I want to thank myself. I was hesitant to do a PhD because I was worried it would take too long. I had told myself that I would finish my PhD faster than I finished my MSc (which took 4 years). I was on track for this and would have achieved it if I defended August 14, 2023. Instead, in May, I stepped away from my thesis for a semester, and defended four months later, on December 14, 2023. Advocating for myself to take a mental health break when I was inches away from the finish line was an extremely hard decision, but it was also the best thing I ever did. I am thankful that I allowed myself to be vulnerable, that I advocated for myself, and that I pushed myself to do the best work I was able to. I am so proud of this work and what I accomplished, the relationships I built, and the knowledge that we shared. I am thankful for all the learning I allowed myself to do, and the imperfections I intentionally chose not to fix for my own wellbeing (sorry appendices, but just like the appendix in the human body, it was something that could have played a role, but instead I chose to allow this thesis to live without them!). I hope this last lesson of advocating for my own rest is the lesson that sticks with me the most.

Especially to those doing social justice work in engineering, it is important to remember this quote from Tricia Hersey’s manifesto on Rest is Resistance:

“What we have internalized as productivity has been informed by a capitalist, ableist, patriarchal system. Our drive and obsession to always be in a state of “productivity” leads us to the path of exhaustion, guilt, and shame. [...] The distinction that must be repeated as many times as necessary is this: We are not resting to be productive. We are resting simply because it is our divine right to do so.” (Hersey, 2022, p. 48)

I appreciate all the knowledge and relationship my thesis and dissertation taught and will continue to teach me. However, it is only through rest and reflection that I was able to learn those lessons. As engineering justice advocates, we must remember that our best work happens when we rest, when we engage in joyful relationships, when we leave time for love, and when we are able to internalize the message that rest *is* resistance.

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