”Measure Twice, Cut Once” and other Disciplinary Barriers to Recognizing Excellence in Engineering Education Research

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Abstract
This paper began as a request for advice about how to navigate the tenure and promotion (T&P) process as an engineering education researcher (EER) and transformed into a Reflective Thematic Analysis (Braun et al., 2022) of five institutionally contextualized EER narratives. Together, our five stories make EER work visible as research to those responsible for our job security and advancement. Our analysis of these experiences is rooted in four key concepts: (1) Lave and Wenger's (1991) situated learning in a community of practice, (2) Gouldner's (1957) analysis of academics' latent social roles, (3) Riley's (2017) critique of academic rigor as a marker of excellence, and (4) Rottmann et al.'s (2023) notion of proud moments as a strategy for grounding excellence in our lived experiences. The overarching story emerging from our analysis involves EER scholars on the periphery of traditional engineering norms who nevertheless fight to remain locally relevant, carving out space for our emerging field and the next generation. We conclude with practical strategies for early career EER researchers navigating the T&P process and for T&P chairs and reviewers assessing the quality of EER research portfolios.

Keywords: Engineering Education Research; Tenure & Promotion; Higher Education; proud moments; reflective thematic analysis

Introduction
Among other cultural axioms for measurement and evaluation, engineers are often encouraged to follow the carpentry principle "measure twice, cut once," equating quality with a fixed metric. In contrast to this assessment *of* performance, teachers are increasingly being taught to practice assessment *for* and *as* learning (Earl, 2013), linking the assessment process with dynamic growth for both those being assessed and those doing the assessing. While neither of these assessment strategies is adopted by all engineers or all educators, the underlying assumptions reveal two distinct approaches to assessment—measuring individuals carefully against a yardstick to discern the extent to which they have attained predetermined outcomes (summative evaluation) and scaffolding personal development through iterative, idiographic feedback with the potential to reframe our understanding of excellence (formative assessment) (Scriven, 1991). We offer these two modes of assessment to set the stage for early-career faculty members' tenure and promotion (T&P) process in the interdisciplinary field of engineering education.

As Engineering Education Research (EER) falls at the intersection of engineering and education, the two disciplinary norms described above may serve to inform the norms, practices, and scaffolding of the emerging EER field. So long as these norms are framed as complementary rather than contradictory, they may be used for meaningful T&P assessment. Unfortunately, siloed disciplinary norms can be hard to surrender. Some EER scholars are held to traditional engineering standards for research, making it difficult to gain recognition for our research as anything other than "good teaching," while others are held to social science research standards, creating steep, independent learning curves for engineering graduates. Members of the Liberal Education/ Engineering & Society (LEES) Division of the American Society of Engineering Education (ASEE) who conduct humanistic inquiry may experience even greater credibility

hurdles as they contemplate ways to bridge the creative, literary expectations of book publication fields with the analytical, productivity-driven expectations of scientific fields relying on h-index and journal impact factor. Whether we enter the interdisciplinary field of EER through initial training in engineering, the social sciences, the humanities, or other fields, it remains unclear what values, practices, and quality indicators to use when assessing our research.

The authors of this paper came together to discuss standards required for assistant professors in EER to successfully move through tenure and promotion. At the time, we imagined that one possible way forward would be to generate a new set of interdisciplinary benchmarks for EER that builds on a selection of common practices and norms from existing disciplines (Giri, 2002). Thought-provoking feedback from our abstract reviewers, however, convinced us that decontextualized advice would be counterproductive, just another form of "measuring twice, cutting once." A search for alternate EER benchmarks may provide a quick fix for assistant professors trying to retain their jobs in fields that employ traditional technical benchmarks, but over time, any set of fixed standards may similarly reify monolithic notions of excellence. For this reason, we decided to document our experiences translating EER excellence into locally apprehensible impact using the ten institutional contexts with which we are most familiar, settling on the following question: *How can we be more intentional about integrating EER principles and practices into formalized measures of quality without fixing those measures in time, space, and dominant paradigms?*

To answer this question, five engineering education researchers[1] with varying levels of administrative responsibility and experience set out to build a multi-institutional case for diversifying EER excellence. Our analysis of T&P as a contextualized, value-laden process reflects the ASEE-LEES Division's attention to implicit and explicit values in engineering education. We ask what EER excellence looks like in the many scholarly communities engaged in this work and how these experiences land in our local institutional contexts. Each of us responds to this question by reflecting on the following prompts:

1. What constitutes EER excellence in the scholarly communities of practice where we feel most at home?
2. What T&P benchmarks have we experienced in our home institution(s)?
3. What challenges have we encountered when attempting to translate EER excellence from our communities of practice into measures that are recognized and valued within our home institutions?
4. What have we done to enhance visibility for EER in our home institutions?

What do we mean when we use the compound term *EER Excellence*?

Toni Morrison (1987) has powerfully pointed out that "definitions belong to the definers, not the defined." Defining terms can provide a useful explanatory function that may have a colonizing or liberating impact depending on who is defining which terms, for what purpose, and at what scale. In this paper, we—a group of relatively privileged white, cis-gender, tenured/tenure-track engineering education researchers working in a field that remains on the periphery of our

[1] The five authors of this paper have come to EER with undergraduate degrees in either engineering or education. We encourage LEES members with undergraduate training in the humanities to draw on their experientially grounded wisdom to answer the question, "What counts as research excellence in Engineering Studies?"

respective North American faculties of engineering—delimit the term *EER excellence* with a liberating intention. We do so, however, with the awareness that our experiences are not universal. Our intention to release the term "research excellence" from normative benchmarks used in many traditional engineering T&P processes may be liberating, but if we use our socially-located experiences as a foundation for benchmarks against which all EER scholars are evaluated, the project will take on a regulatory, hegemonic function (Gramsci, 1971). Similarly, given that T&P processes are multi-scale, with the organizational location of committees varying at the departmental, college, and university levels, each with differing norms around how much forbearance they give to lower levels of review, a monolithic set of EER benchmarks would fail to be evenly applied across institutional contexts. For these reasons, rather than defining EER excellence, we will explain what we mean when we use the terms *EER and EER excellence* in each of our institutional contexts so that readers can follow our argument with their specific social and organizational locations in mind.

First, leaving aside the idea of "excellence" for a moment, each of us means something slightly different when we use the term *Engineering Education Research (EER*). Still, our point of departure for this paper is shared. That is, we adopt the practice of considering engineering education broadly in ways that transcend formal classroom instruction in undergraduate engineering classrooms. We are deliberately opening the EER tent, not to obscure or confound important conceptual, disciplinary, or paradigmatic distinctions between sub-fields, but rather to ensure that our paper avoids reifying the epistemic hierarchy game (Carrigan & Bardini, 2021; Koro-Ljungberg & Douglas, 2008; Riley, 2017), accepting only those aspects of EER that are most proximate to post-positivist norms.

Related to this point, we need to describe what we mean when we affix *excellence* to EER. We are not referring to the instrumental body of research on "best practices" (Hensey, 2001; Layne, 2002; MacLean et al., 2018) that reifies a singular set of actions anointed by authoritative figures to be the "best" across all contexts. On the other end of the spectrum, we are also disinterested in creating a "free-for-all" where any kind of EER inquiry is accepted as good enough. When we speak about *research excellence in engineering education*, we wish to make space for studies conducted with integrity, care, intentional paradigmatic alignment, and authentic purpose. For readers interested in a more comprehensive examination of EER excellence, we direct you to a large-scale study funded by the U. S. National Science Foundation on this topic (Jamieson & Lohmann, 2012). From Jamieson & Lohmann's (2012) work, we borrow two key arguments: 1) EER "excellence" requires a creative, theoretical foundation, and 2) social impact extends beyond technical curiosity.

As an academic field like any other, the extent to which EER research aligns with these guidelines needs to be determined through peer review, raising the question: who are our EER peers? If traditionally trained engineering professors engaged in technical research are our peers, it would make sense for them to comprise our T&P committees. This decision, however, like the notion of a "peer," would have to be reciprocal. That is, our technical colleagues would have to ask themselves if they would feel comfortable having their T&P committees comprised of EER scholars. The fact that this kind of question is rarely asked reflects not only a hierarchy of engineering research but also a lack of trust and respect for the research expertise of EER scholars. In this paper, we argue that T&P committees for EER professors should include other

EER professors, at least one with a research focus and paradigm reflecting that of the assistant professor undergoing review. The main difficulty for T&P chairs, however, is that most engineering schools lack a critical mass of tenured EER peers. As a result, the responsibility to define EER excellence is often left in the hands of tenure-track engineering professors without EER training.

As the field of EER has matured, engineering schools with dedicated EER programs and departments have begun to address the issue of T&P review through increasingly diversified and relevant mechanisms, some of which will be illustrated in this paper. While these mechanisms have resulted in greater recognition of our research, the responsibility for peer review has mostly been shouldered by EER trailblazers who are often burdened by heavy administrative loads and required to spend excessive time and energy translating EER excellence into academic benchmarks rooted in other disciplines. This work is not only time-consuming but can also be emotionally draining for EER scholars who have experienced persistent invalidation and distrust from their colleagues. We hope this paper will lighten their load by providing T&P committees with five EER narratives rooted in ten institutional contexts.

Our understanding of excellence depends not only on our training or disciplinary socialization but also on our epistemological assumptions and worldviews. Our struggle as EER scholars to convince our more traditional colleagues to trust our expertise when it comes to evaluating our work has roots in the hierarchies of disciplines with preferential treatment to science and technology over the liberal arts, a concept characterized as "majorism" by Carrigan and Bardini (2021). Assumptions about the nature of knowledge and what constitutes social impact, both of which are important constructs in the definition of excellence, differ among engineering education researchers. To a positivist or post-positivist researcher, EER excellence may involve large-scale quantitative studies validating an educational intervention or phenomenon across contexts (Lappalainen, 2015; Toor & Ogunlana, 2009). To an interpretivist or social-constructivist EER scholar, research excellence may involve an ethnographic case study grounded in the voices and perspectives of professional engineers, students, or engineering educators as they grapple with an issue in context, sometimes in small numbers (DeMonbrun et al., 2017; Finelli et al., 2012; Hess et al., 2017; Holsapple et al., 2012; Oliver et al., 2013; Slaton & Pawley, 2018). To a critical theorist, EER excellence may involve challenging underlying assumptions about normative or hegemonic engineering education practices to make them more accessible to underrepresented communities (Baillie & Levine, 2013; Beddoes, 2017; Cech & Finelli, 2024; Cruz et al., 2023; Holly, 2020a; Leydens et al., 2012; Mejia et al., 2018; Nieusma & Blue, 2012; Paul et al., 2023; Pawley, 2019; Pawley & Hoegh, 2011; Riley, 2012; Riley et al., 2020; Riley & Lambrinidou, 2015; Rottmann, 2025; Rottmann, Moore, & Chan, 2023; Seniuk Cicek, Masta, et al., 2023; Slaton & Pawley, 2018; Slaton & Riley, 2024; Smith, 2021). Finally, to a post-structuralist researcher (Foucault, 1980; Smith, 2002; Spivak, 1988), EER excellence may involve examining how EER discursively functions in a socio-historical context (Downey, 2009; Faulkner, 2000; Riley, 2017; Secules, 2019). To achieve tenure and contribute meaningfully to the field, EER researchers should be assessed in ways that align with our respective paradigmatic traditions. Unless our work is rooted in post-positivist traditions, we should not be measured against metrics equating excellence with large sample survey testing, quasi-experimental studies with control groups, or other empirical approaches used to discern the "truth" about a phenomenon (Walther et al., 2017).

Regardless of paradigmatic roots, it is our responsibility as researchers in this interdisciplinary field to answer research questions in ways that align with our theoretical perspectives, sharing findings that are credible and meaningful to experts in our respective sub-fields. Like other academics, we must be assessed by a committee of peers whose expertise allows them to meaningfully ascertain what constitutes excellence in a particular theoretical or disciplinary tradition. We use the term *EER excellence* in this paper to make our scholarly inquiries visible for T&P, but beyond this instrumental objective, we believe that EER scholars should and do strive to accomplish excellent work. When it fails to be characterized as such, it may be due to the field's marginal status in engineering, rather than to accurately assessed low quality research. Engineering education researchers cannot be fairly assessed against yardsticks made to measure excellence in more traditional engineering fields.

Conceptual Framework: Situating Excellence in EER Communities of Practice

We analyze our EER journeys using an analytic framework rooted in four key concepts: (1) Lave and Wenger's (1991) situated learning in a "community of practice," (2) Gouldner's (1957) analysis of academics' latent social identities, (3) Riley's (2017) feminist critique of academic "rigor" as a marker of excellence, and (4) Rottmann and colleagues' (2023) notion of proud moments as a strategy for grounding excellence in our lived experiences. First, from Lave and Wenger's (1991) situated learning theory, we borrow the idea that learning is an inherent dimension of social practice. Diverging from the cognitive psychological tradition of learning as the integration of new knowledge into existing mental schema, Lave and Wenger draw on cultural anthropology to define learning as a process of legitimate peripheral participation in a community of practice. The first concept, "legitimate peripheral participation" (p. 35-37), describes the active process by which newcomers learn to become full members of a mature field through participation in shared work, while the second, "community of practice" (p. 98-100), depicts the social field on which community members interact. Lave and Wenger's situated learning theory embeds reciprocal learning in social practices, much like the formative learning we presented at the outset of this paper. Novices learn how to engage in social practice from experienced peers, and veterans learn how things might be done otherwise from novices. Figure 1 visually depicts two different EER communities of practice, with external scholarly networks on the left and university settings on the right.

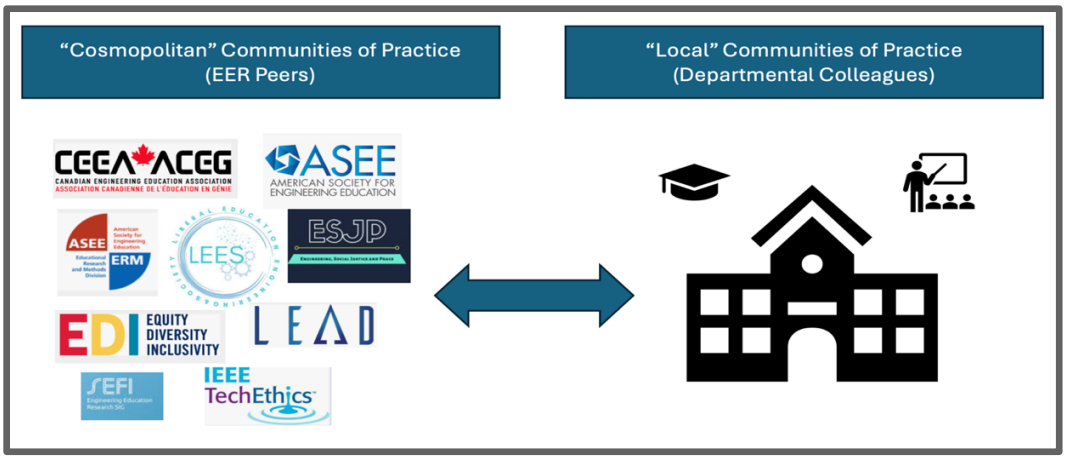

Figure 1: Cosmopolitan vs Local Communities of Practice

This framework urges us to ask, “Who are our people?” “Are they primarily internal or external to our home institutions?” “How did they help us get better at EER when we were starting out?” “Did we study EER for our own graduate journeys, learn from peers in our respective departments, or find our way into EER as interested researchers trained in other fields?” “How did we, as EER novices, learn to become full members of this interdisciplinary field?” “What have we contributed to EER as experienced researchers in other disciplines?” and “How have our contributions perceptibly changed the field?”

The question, “Who are our people?” is partly about the contexts in which we find ourselves and partly about our professional identities. Nearly seven decades ago, Gouldner (1957) conducted a sociological study of academics at a small liberal arts college and identified two latent social identities that reflect these internal and external communities: “locals” and “cosmopolitans” (p. 290). This is the second concept we leverage for our analytic framework. Academics with a “cosmopolitan” identity were more likely to have an external reference group orientation, have high levels of commitment to specialized roles, and be less loyal to their home organizations. In contrast, academics with a “local” identity were comfortably embedded in their employing organizations, low on commitment to specialized role skills, and more likely to adopt an inner reference group orientation. Gouldner’s conceptual distinction between cosmopolitans and locals is relevant to our analysis of the EER T&P processes because this professionally consequential evaluation depends on internal and external peer review. What is the relationship between internal and external peers? Engineering professors working in established fields may not have to ask this question because their department chairs and members of their T&P committees are more likely to be familiar with external scholarly networks in the field, often as members themselves. The same may be true for EER faculty working in well-established EER units with a critical mass of tenured colleagues. When EER scholars pursue T&P in traditional engineering departments or colleges, however, the peer-review process becomes more challenging since department chairs, deans, and T&P committee members tend to be less familiar with external EER associations, practices, standards, and norms.

Third, in addition to considering the EER-intensity of one’s home department, we also need to consider paradigmatic traditions. If members of a T&P committee share an EER professor’s epistemological assumptions, it is easier for them to recognize research competence than if there is a fundamental disagreement about what constitutes credible inquiry (Seniuk Cicek & Friesen, 2018; Seniuk Cicek et al., 2020). For example, researchers whose work is rooted in critical theory may be recognized for their socially impactful and conceptually clear contributions by members of the LEES Division of ASEE, but their writing may be misread as non-scholarly “opinion” or “criticism” when assessed by colleagues trained in post-positivist methodologies who require epistemic neutrality as a baseline for high-quality research. Riley’s (2017) analysis of “rigor” as a dangerous, patriarchal proxy for EER quality is not only a powerful, socially impactful example of EER research, but also points out very clearly and artfully that epistemic neutrality is a myth. Our conceptual lens for this paper draws on Riley’s argument that “rigor is used to maintain disciplinary boundaries, with exclusionary implications for marginalized groups and marginalized ways of knowing” (p. 249). One way to heed Riley’s warning and avoid equating EER excellence with exclusionary norms is to socially locate our own experiences doing EER in scholarly communities that have affirmed our efforts. We select affirming

communities, not because we are looking for nice people to help us advance our careers, but because the communities of researchers who have recognized our scholarly contributions are well-positioned to help us frame these contributions as discipline-specific instances of research excellence. By connecting our contributions to established EER networks, we facilitate the peer review process for T&P chairs and committee members, including, but not limited to, those whose benchmarks are rooted in other academic traditions.

We composed the five EER narratives below by reflecting on a proud moment in context. Accordingly, we leverage Rottmann et al.'s (2023) analysis of "proud moments" as the fourth element of our analytical framework. By locating our proud EER moments in established research networks and associations, we aim to disentangle ourselves from normative T&P metrics rooted in the "hidden curriculum" (Snyder, 1970) of our home institutions. That is, instead of "measuring twice and cutting once" to achieve T&P rigor against a traditional engineering yardstick, we are operationalizing EER excellence *for* and *as* learning (Earl, 2013) in the academic contexts where we find ourselves living and, sometimes, thriving.

Method: Enhancing the Transparency of EER Advancement through Reflexive Thematic Analysis

This paper began as a request for advice about how to navigate the T&P process. After a difficult annual review conversation, the first author reached out to four experienced and approachable EER professors in her network to see what benchmarks they used in their T&P processes. They all generously agreed to provide her with support. At the first meeting, we decided to leave a trail for others with similar questions and concerns by co-authoring a paper based on our experiences navigating and helping others navigate T&P. We met three times over the course of three months, using 1-hour working meetings to reflect on shared prompts and collaboratively analyze our reflections. Individual writing prompts during these meetings included the following questions: Who are your EER people? How have they supported you? What challenges have you faced getting EER recognized at your home institution? Share a proud EER moment. How did this moment land in your home institution? What challenges have you faced translating EER excellence into measures that are recognized by your engineering colleagues at home? What are you working on now? Between our second and third meetings, we consolidated these questions into the final four prompts listed on page two of this paper and connected the first three prompts with a "proud moment" reflection using a series of questions illustrated in Table 1.

We shared our written reflections 24 hours prior to our third meeting and committed to familiarizing ourselves with the five narratives. For our final meeting, we came together and reviewed the narratives using a truncated version of Braun et al.'s (2022) Reflective Thematic Analysis (RTA) to distill unique themes and common patterns across personal, disciplinary, and institutional stories (Baker, 2019). We began by sharing overall impressions to help us understand our analytic tendencies and then reflected on the data, sharing semantic codes on virtual "stickies" using a software platform called Lucid https://lucid.app. After spending half an hour coding, we collectively identified themes across the individually generated codes. Finally, to supplement our primarily inductive analysis process (Bruner, 2004; Clandinin, 2006; Ibarra & Barbulescu, 2010), the first author completed a synthesizing round of deductive analysis rooted in our conceptual framework and invited feedback from her co-authors.

Table 1: Locating EER excellence in proud moments

Research Questions	Reflective Prompts grounded in Proud Moment
What constitutes EER excellence in your communities of practice?	Locate yourself in your various communities of practice, pick one proud moment story and contextualize the experience. Where did it happen? What happened? Who were the people who recognized that this was an example of EER excellence? How did they help? What does this experience say about one contextualized way of understanding EER excellence?
What EER benchmarks have you experienced in your institutional context?	Where does EER sit in your institutional context? (department, program, off the side of your desk, other?). What counts as research excellence in your unit? How do you know? How does this relate to the T&P process in your unit?
What challenges have you encountered when striving to translate EER excellence into measures that are recognized and valued at your home institution(s)?	How did your proud moment land in your institutional context? Did it provide external validation for EER work and/or was it dismissed as not real engineering? What have you done to enable proud EER moments to be recognized as excellence by your institution and count towards T&P? What are some barriers and supports to this recognition?

Findings: Navigating EER Excellence in Ten Institutional Contexts

The five narratives illustrated in the figures below remain in draft form, shared in the order they came in. Two of the authors (Cindy R and Jill) shared their experiences in one institutional context, while the other three authors shared their experiences in two (Cindy F, Justin) and four (Donna) institutional contexts respectively. Table 2 provides positional and organizational details for each of the five authors.

Table 2: Contextualizing the Narratives

Name	Current Role	Relevant past roles	Tenured	T&P Admin
Cindy Finelli	Professor, Electrical Engineering & Computer Science, Professor, Education, **University of Michigan**	Director, Engineering Education Research Graduate Program; Director, Center for Research on Learning and Teaching in Engineering, **University of Michigan** Associate Professor, Electrical and Computer Engineering, **Kettering University**	Yes	Committee member
Cindy Rottmann	Assistant Professor, (ISTEP) Engineering Education; Director, Collaborative Specialization in Engineering Education, **University of Toronto**	Assistant Professor, Education, **University of Manitoba;** Director of Research, Troost Institute for Leadership Education in Engineering, **University of Toronto**	No	None
Justin Hess	Associate Professor, Engineering Education, **Purdue University**	Assistant Director, STEM Education Innovation and Research Institute, **IUPUI**	Yes	None
Jill Seniuk Cicek	Associate Professor, Engineering Education, Acting Associate Head, Engineering Education. **University of Manitoba**	Assistant Professor, Centre for Professional Practice and Engineering Education **University of Manitoba**	Yes	Committee member

Donna Riley	Dean of the School of Engineering, Professor, Department of Civil, Construction & Environmental Engineering, **University of New Mexico**	Head, EER, **Purdue University**; Interim Head, EER, (**Virginia Tech**; Program Director, EER, **National Science Foundation**; Associate Professor and Founding member of Picker Engineering Program, **Smith College**	Yes	Chair

Figures two to six include draft responses to the three shared prompts, as well as a fourth prompt that emerged from our narratives about the ways we had actively enhanced visibility for EER at our respective institutions.

Figure 2: Narrative 1-Classically Trained Engineer working in a Traditional Department (United States)

Narrative 1: Cindy Finelli – University of Michigan and Kettering University

What constitutes EER excellence in your communities of practice?

Although I was classically trained as an electrical engineer, I didn't pursue that field for post-graduate research. Instead, my career trajectory shifted when I discovered engineering education research (EER). I wasn't formally trained in EER, so over the span of several years, I dedicated myself to learning the field through textbooks, journal articles, conferences, and workshops, and by cultivating a network of mentors and collaborators across the country.

Securing my first (and second) major research grants in EER was a proud milestone while I was at Kettering University. These early projects (and all of my subsequent ones, to be honest) were defined by their truly multi-institutional and multidisciplinary collaboration. The diverse collaborations were critical for exploring all aspects of the research and conducting high-quality investigations. In my experience, though, this collaborative spirit - central to EER - often contradicts the more individualistic traditions of electrical engineering. As someone embedded in an electrical engineering department, I've had colleagues who value the funding my work brings, but who do not always appreciate or fully support its collaborative and interdisciplinary nature.

Obtaining substantial grant funding not only provided external validation from respected sources, such as the NSF, but also lent credibility to my research in the eyes of my peers. In my experience, this recognition, and the ability to foster effective collaboration, constitute key aspects of EER excellence, and these standards can resonate across other disciplines as well.

What EER benchmarks have you observed or experienced in your institutional context?

Within my institution, we offer a graduate program for students pursuing EER as a career. However, my position is embedded within a traditional electrical engineering department (rather than in an EER unit), which means my research is often evaluated by traditional metrics: external funding, graduate student mentoring, teaching evaluations, and scholarly output. I have been responsible for clarifying to my electrical engineering colleagues how EER metrics align with these traditional ones - highlighting, for example, that EER grants tend to be smaller than those in traditional engineering since we don't require expensive equipment, and that our scholarly output is typically more collaborative in nature. Fortunately, my department has been open to learning about these distinctions and has adjusted expectations for my promotion and tenure accordingly.

What challenges have you experienced when striving to translate these metrics of excellence in ways that are recognized and valued at your institution?

It can be difficult to have engineering colleagues learn about or engage with my research. To publicize some of my research accomplishments, I've worked with my department's marketing office to share news of my grant awards through newsletters and university news articles. This visibility has helped validate my

work, yet some colleagues continue to view it as outside the scope of "real" engineering. Rather than dwell on these faculty, I focus my efforts on making my research findings accessible to interested colleagues and normalizing EER outputs within the department.

What have you done to enhance visibility for EER in your institution?
It is also hard for junior EER colleagues to navigate the T&P process. To address this challenge, I mentor junior colleagues to help them advocate for their research and establish its legitimacy. I also serve on T&P committees to help department and institutional leaders better understand and appreciate the unique contributions of EER. And I've been involved in broader efforts to support and mentor colleagues across the U.S.

Figure 3: Narrative 2-Social Scientist working in a non-departmental EER Unit (Canada)

Narrative 2: Cindy Rottmann – University of Toronto

What constitutes EER excellence in your communities of practice?
As a social scientist who entered engineering following a brief academic career as an assistant professor of educational administration, my conception of EER excellence has been shaped by four communities: 1) social scientists who frame research as theoretically-driven inquiry, 2) engineering leadership educators who gather insights from professional practice to support students' school to work transitions, 3) engineering educators who evaluate the impact of innovative pedagogy in undergraduate classrooms, and 4) humanities-trained educators who introduce philosophical, literary, and arts-based inquiry into engineering education. While all four communities have shaped my understanding of EER excellence, I tend to thrive in inclusive, reciprocal, creative networks that foster interdisciplinary collaboration, while feeling stifled by competitive fields of socialization with fixed conditions for participation, achievement, and acceptance.

A powerful EER "proud" moment materialized in the form of an academic service cold call. In the fall of 2022, Joe Herkert and Justin Hess, co-chairs of the IEEE-Ethics 2023 conference at Purdue, invited me to join the program committee. I had never been to an IEEE-ethics conference as I presumed myself to be a disciplinary outsider. I lacked formal training in both ethics and engineering, yet I was welcomed with open arms, even winning the best paper award. While the award helped me feel like my research belonged in this this community, it was the relational inclusivity and receptivity to my contributions that helped me breathe. Justin and Joe treated me like a person whose insights mattered, Andrew Taylor, who chaired my paper session, told me he was moved by my land acknowledgement, three graduate students told me their research had been shaped by an article I had written on ethics and equity three years earlier, and the plenary speaker, Colleen Murphy, helped me see social scientists as key yet overlooked contributors to engineering ethics research. I knew I belonged at the conference when she described social scientists as a bridge to help us connect philosophers' and engineers' somewhat incongruous approaches to professional ethics. Each of these interactions helped me view myself as a credible engineering ethics researcher even though I was neither an engineer nor an ethicist by training. Stepping back for a moment, this unplanned academic experience taught me that EER excellence is a socially constructed process continually shaped and re-shaped by an interdisciplinary community. Social scientists need not be relegated to "soft skills" instructors visible only during periods of program accreditation (ABET/ CEAB). Rather, just like our colleagues in the technical engineering disciplines, we have disciplinary depth and analytic acuity to offer the field.

What EER benchmarks have you observed or experienced in your institutional context?
At the University of Toronto, EER is primarily located in a non-departmental unit within the Faculty of Applied Science and Engineering (FASE) called the Institute for Studies in Transdisciplinary Engineering Education and Practice (ISTEP). We offer a Collaborative Specialization in Engineering Education through a partnership between our schools of Engineering (FASE) and Education (OISE). Faculty supervisors come from 6 departments—four in engineering and two in education. ISTEP faculty members who supervise graduate students must be cross appointed to and admit graduate students through at least one of these six departments. T&P processes for ISTEP faculty remain unclear (to me), particularly for the two of us who

are tenure track and 100% EER. The majority of ISTEP faculty are either teaching stream or have partial budgetary appointment to a traditional engineering department. Based on University of Toronto policies, I believe my research will be evaluated using three traditional metrics: scholarly output, external funding, and graduate student supervision.

What challenges have you experienced striving to translate these metrics of excellence in ways that are recognized and valued at your institution?

Many of my engineering colleagues in established departments view ISTEP as a teaching/service unit, making it difficult for us to gain recognition and resources for our research. At the faculty level, we move in and out of institutional focus, with heightened visibility every four years leading up to program accreditation. As someone with a PhD in Educational Administration (i.e. formal training on how educational institutions work), I have advocated for ISTEP to build research capacity through three well established academic structures present in every other engineering department: an Associate Chair-Research, a repository of successful grants, and a departmental research award. I have consistently been told that these ideas do not fit with our unit's objectives. The implicit message is that the small number (n=2) of fully appointed tenure-track ISTEP faculty must meet traditional engineering research metrics without traditional research support structures in place. Even with these supports, the metrics would be difficult for us to meet, especially for someone like me trained in the social sciences, who conducts theoretically driven studies rooted in a critical paradigm using primarily qualitative data.

I am deeply committed to ISTEP and the faculty of engineering at UofT (FASE) but have observed that my research productivity and quality are almost exclusively recognized by external EER networks. In the past ten years, I have won nine "best paper" awards, yet I continue to receive lower than average ratings for research during my annual reviews. I have been told by a few colleagues that EER "best paper" awards do not count as much as technical engineering "best paper" awards, but it is unclear what I am supposed to do with this information. An even greater concern is that in contrast to the U.S. where NSF includes EER as an eligible research domain, the Natural Science and Engineering Research Council of Canada (NSERC) has never included an EER stream. The Social Science and Humanities Research Council of Canada (SSHRC) has recently begun funding a small number of EER projects, but we are still in the early days, with fewer than ten SSHRC funded EER projects across Canada. Despite these narrow odds, I have had success collaboratively securing three SSHRC grant applications, one as a Primary Investigator and two as a Co-PI. Unfortunately, SSHRC has fewer awards per pool of applicants than NSERC, and each award has a lower monetary value than corresponding NSERC awards. What this means in structural terms is that social scientists working in engineering face more competition for a smaller pot of money than do our technical peers. One consequence of the significantly lower dollar value of SSHRC vs NSERC grants is the limited capacity to bring graduate students into my research group. In contrast to other faculty who require physical lab space for their students, I can do my research anywhere with relatively little equipment. While this is a financial benefit to the faculty, it also means I am not eligible to apply for large infrastructure grants earmarked for my technical peers, dropping my comparative funding levels as an early career researcher. The relatively small team of graduate students I can afford with limited grant money combined with the intensive interdisciplinary training involved in helping engineering students engage in social science research, makes it difficult for me to achieve the productivity benchmarks set by my engineering peers (funding levels, graduate student supervision & publication).

Adding to the uphill battle of building a thriving research program, many EER professors, including my ISTEP colleagues, tend to be more invested in critical pedagogy and socially impactful service. This means we often teach, assess, and lead in ways that are relationally intensive, decreasing our available time to build a thriving research program. I have been told to spend less time refining my teaching and voluntary EDI service, but that kind of tradeoff would penalize students and members of several EER and EDI communities in exchange for personal job security, contradicting my teaching philosophy and commitment to social justice. Finally, when it comes to assigned service, many ISTEP faculty are assigned to administrative leadership roles at the early career stage, further eroding the time available to build thriving research programs. These structural barriers to success are largely invisible to colleagues who may interpret lower research productivity among EER faculty as a measure of poor performance. Fortunately, I

have had excellent mentorship from many colleagues who have helped me find my way at UofT, including but not limited to—Doug Reeve, Emily Moore, Susan McCahan, and Nina Bascia.

What have you done to enhance visibility for EER in your institution?
I am a strong advocate for EER at my institution, regularly re-framing disciplinary norms in engineering through the articles I write, presentations I deliver, impromptu critical conversations with colleagues, and participation in a voluntary EER reading group. In a more formal way, I have found ways to connect my institutional leadership role as Director, Collaborative Specialization in Engineering Education with my voluntary service role as Co-Chair of the Developing Engineering Education Research SIG of the Canadian Engineering Education Association (CEEA-ACÉG DEER). Through this national leadership role, I have worked with my co-chair and two other SIG chairs to plan and deliver research related professional development to students and colleagues across Canada.

To amplify the impact of our EER research at ISTEP, I have worked with institute and faculty-wide communications staff to publicize our achievements. The resulting stories provide visibility to EER in ways that align with recognizable institutional metrics, but they do little to support wider recognition of ISTEP as a research unit. A more effective strategy I have used involves building relationships with engineering colleagues in Associate Chair-Research roles through my assigned service on the FASE research committee. This role has helped me understand how research operates in FASE while enabling me to foster collegial bonds with individuals tasked with building research capacity in their departments. Some colleagues continue to view EER as outside the scope of "real" engineering, while others have expressed interest in enhancing the social impact of their engineering research, examining policy implications of their work, and discussing the additive power of qualitative analysis in technical research projects. Like Cindy (Finelli), I have focused on colleagues who see the value in EER. For the critical mass of engineering faculty who question the legitimacy of EER, I find other ways to connect. Over time, I hope to better understand and appreciate their research, while regularly inviting them to ask questions about mine. Perhaps these relationships will seed a more interdisciplinary community consistent with our FASE strategic plan. In the meantime, I meet with early career researchers in engineering and education as well as supportive and experienced EER mentors at my institution (Susan McCahan & Emily Moore) who have helped me unpack the hidden curriculum of academic advancement at the University of Toronto.

Figure 4: Narrative 3- Engineer trained in EER, working in an EER program (United States)

Narrative 3: Justin Hess – Indiana University–Purdue University Indianapolis and Purdue University

What constitutes EER excellence in your communities of practice?
When I read this series of questions, I cannot help but think of my time at IUPUI. I joined IUPUI as a postdoctoral scholar in January 2016, shortly after finishing a mini-postdoc at Purdue which directly followed my eight years of studies at Purdue (BS→MS/PhD). At IUPUI, I was part of SERI, or the STEM Education Research Institute (which was later renamed SEIRI, or the STEM Education Innovation Research Institute). Grant Fore was a Research Associate at SERI before I joined. Grant had been at SERI for many years and was pursuing his PhD in anthropology remotely from the University of Cape Town. Grant was a guiding mentor for me. He had a great awareness of the IUPUI campus and helped me think about the possibility for community development across the campus in new ways. Grant had already developed a Templeton foundation proposal, which was not funded. We worked together to repurpose the proposal for the NSF "Cultivating Cultures of Ethical STEM" program's "Institutional Transformation" track. We put together a team comprised of leaders of different campus centers, including the Center for Service Learning and the Institute for America Thought. Together, we developed a theoretical framework of ethical becoming that we grounded in a pedagogical framework focused on integrating community-engaged learning and ethical reflection (I-CELER). We also worked with select departments at the university (Biomedical Engineering and Earth Sciences) to identify faculty participants who would participate in a year-long faculty learning community and then integrate I-CELER into their courses. We did not receive funding for our first submission – we received a "Not Competitive" designation from NSF, but relatively minor

comments. One was that the project PI was not senior enough in the organizational hierarchy. So, we moved from Charlie Feldhaus as PI (Charlie was the head of an engineering department at IUPUI) to Kathy Johnson, who was the Executive Vice Chancellor at IUPUI, or #2, so to speak. This change, coupled with tightening the proposal, led to a successful resubmission. The project was five-years long. In the first year, we gathered data in courses to see the "baseline," developed the year 2 faculty learning community, and recruited participants in departments. There were many proud moments throughout the project, ranging from getting the funding to see faculty have many 'ah-ha's throughout the FLC itself, seeing folks share and celebrate their great work in annual celebrations where we invited other campus or community leaders, and seeing FLC participants (BME and Earth Sciences faculty) go onto to do other great things, including producing stellar DBER scholarship among a few BME faculty without the PIs to revamping the curriculum and tightening community partnerships throughout the Earth Sciences department. Looking back at the questions, I often think of how silly it felt to have to change PIs and how that seemingly small change led to us getting funding; but as I think of the annual celebrations, and having Kathy as an advocate for our project, it really was invaluable. Faculty took it seriously knowing their annual presentations would be seen by the Executive Vice Chancellor. In terms of what this says about EER excellence… it's interesting that I was not in a tenure-track position at this time, nor did I negotiate to have my work here "count" towards my tenure clock. Moreover, IUPUI was disbanded! Nonetheless, it remains one of my highest impact projects, and I believe many of the impacts still live on both among the individual faculty who benefited in ways that really enhanced their careers (oh, two FLC participants become department chairs and eventually several moved into higher level administrative roles). Also, there were many strong relationships developed throughout the project. BUT EER Excellence… well, maybe that's it. EER excellence is building community to advance community goals, capacity, and novel pursuits?

What EER benchmarks have you observed or experienced in your institutional contexts?
The above project wasn't 'complete' when I pursued a job at Purdue, but I do know having a grant like this (as well as a couple others) enabled me to get the tenure-track role at Purdue's School of Engineering Education in 2019. So, in terms of just getting the job, I think this project had many elements that spoke to the 'excellence' our school aspires towards – interdisciplinary work, innovating in curriculum, and of course, getting funding/pursuing scholarship (we published quite a bit out of this project!). One thing I will say that always felt challenging for me is that I did not negotiate this project to "count" towards my T&P. So, when the "benchmark" I hear that we should shoot for is about 1 Million USD, it was not clear the extent to which this project should count. Moreover, I only brought a subset of the funding (less than $100,000) which means the project, from a birds eye view, wasn't really "mine" and I should only count what I brought to Purdue, not the total project. Moreover, returning to Grant, as a not-yet PhD recipient, he was not even listed as an investigator on the project. But the truth is that he and I initiated and spear-headed the work. This is all to say that what is on paper doesn't necessarily recognize the true story about who helped secure funding. BUT I will say, as I was challenged to write my "impact" narrative in my documents, this is one initiative that I described in the writing. Side note: I helped write both an S-STEM and an ADVANCE proposal that IUPUI received where I served as an evaluator and senior personnel, respectively. I worked on the S-STEM briefly before transferring it to another evaluator in our institute, and I believe the ADVANCE was received while I was making my transition to Purdue. I mention both of these as I never listed either on my T&P documents.

What challenges have you experienced when striving to translate these metrics of excellence in ways that are recognized and valued at your institutions?
One of my favorite memories of this project was when we gathered faculty from the two departments to recruit participants. We described the project and goals. While we offered a framework, we weren't telling folks exactly how to enact it in their courses. Nor were we specifying who folks should work with in community. Rather, the goal was to make much of this a collaborative effort. One Earth Science faculty shared with the group, "This all feels rather nebulous." I am not sure if this faculty member ever got on board with the project's ideas, but he never actively participated in the work – but MOST of his colleagues did. I think this involves some measure of validation… I think I already spoke about some other aspects of validation, too, including the departments themselves going in new directions, individual FLC participants

succeeding in new areas for them (including DBER among two BME faculty, in particular!). As we think about barriers, I've found Purdue to be, well, first, much larger than IUPUI and, two, somewhat resistant to widespread curricular changes (ethics or otherwise). Perhaps this is, in part, because I am now part of a "school" rather than part of a "center" – in the latter mode, we were explicitly in a support role (which is my DISC "leadership style") but as a tenure-track faculty member, the normative goal is to be THE lead… the real question I have is, what would it take to do something like this at Purdue and who in upper administration would be willing to be the "Kathy Johnson." Perhaps I simply don't know who high up at Purdue would be that person… that's the optimist in me saying that maybe they exist, and I just don't know them yet. ☺

What have you done to enhance visibility for EER in your institution?

In 2004, Purdue University founded the School of Engineering Education. As a 2019 entering assistant professor, EER was relatively well established and visible across the College of Engineering within which ENE was housed, which is not to say that EER was valued throughout our university (Riley et al., 2021) to learn of our school's challenges establishing an ethics center in ENE). EER was less established at IUPUI when I joined SEIRI in 2016. At IUPUI, I was able to amplify the "E" in STEM by working with STEM faculty who were interested in improving their curriculum, such as by sharing the EER resources that I was most familiar with and fostering new connections between EER and non-EER communities beyond IUPUI. I spent much of my time with faculty in IUPUI's School of Engineering & Technology, engaging in both faculty-initiated and SEIRI-initiated activities. SEIRI-initiated projects included the ethics project I described above, as well as several others. One particularly powerful activity that we conducted to amplify EER—or DBER more broadly—was the SEIRI Seed Grant Program (Dasgupta et al., 2024) which encouraged new educational programming, research on said programming, and new collaborations across campus. As I transitioned to Purdue in 2019, my visibility-enhancing seem to manifest through my service or leadership efforts and my engagement with students in our program. Regarding leadership, I have served as the Deputy Director with the National Institute for Engineering Ethics, which is directed by Brent Jesiek, was brought to Purdue in 2020, and lives in the School of Engineering Education. We recurrently bring together folks to discuss ethics. As two faculty in EER, we thus foster connections between EER and non-EER groups. As a key example, we hosted IEEE-Ethics in 2023 on Purdue's campus, which (1) offered discipline-based RCR training opportunities for Purdue graduate students grounded in EER, (2) provided communication touchpoints between many faculty, students, staff, and practitioners from many disciplines, and (3) brought high-profile attendees to Purdue University, such as then-DARPA Director Stefanie Tomkins, thus highlighting ongoing efforts in EER and ethics at Purdue. Through NIEE, we have also brought together folks through activities like the "Horizons in Engineering Ethics Event"(Jesiek et al., 2025), including Purdue faculty, regional faculty (e.g., from IUPUI), and NIEE board members. Aside from NIEE, the service I do outside of Purdue also enhances EER visibility at Purdue, such as ASEE's LEES program director, serving as Purdue's ASEE Campus Representative, and serving as board chair with the Online Ethics Center. In addition to service/leadership, working alongside future PhD students in EER or related areas is a key modality for enhancing not only EER visibility, but the EER community itself. Within our institution, as our students graduate and receive accolades, EER gets noticed. For example, my most recent graduate, Dr. Andrew Gray just received a provost-level Excellence of Teaching Award at Purdue, which was awarded to ***three*** *students at our university, including only Andrew in the College of Engineering. When we celebrate in April 2026, Andrew will be recognized as the best of the best graduate student instructors in COE at Purdue. Andrew is not an exception—all our students are doing amazing work and celebrating this work in creative and a wide range of ways is key to growing EER visibility.*

Figure 5: Narrative 4- Educator trained in EER, working in an EER program (Canada)

Narrative 4: Jillian Seniuk Cicek – University of Manitoba (UM)

What constitutes EER excellence in your communities of practice?

When I was a PhD student, I was awarded the inaugural Duncan Fraser Emerging Researcher award in 2015 for my qualitative action research project with a Dean Emeritus teaching a first-year Thermodynamics

course. It was such a proud and surprising moment! I didn't apply for it, didn't know it existed, and I was awarded at the banquet dinner by Jennifer Turns, one of the members of the awards committee and a U.S. EER pioneer, whom I so admired. It was a pivotal moment to be acknowledged by a community that I was working hard to emerge in. I felt vindicated by the community, awarded for my research on a project that was a 3-year labor of love. This felt like a pinnacle moment in a journey where I had experienced failure/rejection (at the ABSTRACT level!) for ASEE 2014 for that same project and felt completely inadequate when I was grilled during the Q&A by an engineering educator in our Canadian community while presenting a version of this work in Montreal in 2013. The Duncan Fraser award constituted excellence for me in the EER community, a community which existed outside of the university community at UM where I was studying. An award, however, translates as excellence in both communities – the EER community and the engineering community where I was situated – as everyone in academia accepts awards as the language of excellence.

My EER people are a group of EER scholars at CEEA-ACÉG whom I met first, the REES community, the ASEE ERM and LEES communities, researchers in South Africa, Australia, Ireland, and my 2 UM colleagues – and it was in this order that my network grew. I've been so fortunate to be mentored by many EER scholars including Rachel Kajfez and EER pioneers like Alice Pawley, Karl Smith, and Cindy Atman, whom I was blown away by during an ERM distinguished lecture in 2014, and who took me under her wing and prepared me for T & P as a new faculty member and EER scholar before I even knew what I was getting into! I'm so grateful to her and to so many others who took the time to help pave the way. I've been privileged to belong to and work with many people in this community. I shouldn't complain about my local situation –I'm <u>very</u> happy within my EER network – such good people!!!!

What EER benchmarks have you observed or experienced in your institutional context?

EER at the University of Manitoba lives in our department of engineering education through our 3 research faculty, our departmental members and leaders who know us. Benchmarks I have observed and experienced at the UM, which I have also equated to excellence, are the number of publications (journals mostly, and highly ranked ones at that; book chapters don't seem to count as much by engineering standards in our institution), the amount of money awarded to a researcher, especially individually or as a primary PI (collaborative efforts don't seem to "count" as much as individual work, and we are required to delineate what we did (both quantitatively and qualitatively) when we indicate that we are a co-PI or a co-supervisor), and the number of students graduated. All quantitative measures! There seems to be the need to be strategic and individualistic, mindsets that don't inspire or encourage me and that I don't think are characteristic of our EER community.

What challenges have you encountered when attempting to translate these metrics of excellence into measures that are recognized and valued within your institution?

Faculty members located in more traditional engineering departments often struggle to get beyond "educating engineers" as our role/work. For T&P I did a complete dump of everything I've ever done as an Assistant Professor to, on some level, obtain T&P by volume if what I presented as quality EER work that I believed met the T & P criteria wasn't recognized by or enough for the peers on my committee, none of whom were part of the EER community. Still, I was asked to explain my T & P application twice, once by the committee, and once more by the Chair, for good measure, (though the Dean told me afterwards there were no problems with my application), which was unsettling, and perhaps rare. I have observed that generally, researchers in EER garner less research money; however, I'm beginning to wonder if this should be a strategy: apply for less (minimum) money so you get the award (e.g., a SSHRC (social sciences) for me as I am not a STEM researcher), but you can still claim the prestige of getting a difficult federal award. Additionally, publications should likely be strategic – I've heard about this from colleagues in the US: where to go for 'quick' publications while building on more prestigious ones, such as JEE, and how to slice and dice research to obtain multiple publications from a single project. I wasn't "trained" to do this, and so have thrown much time and effort into, for example, conference publications, thus blocking my way to journal publications. And the amount of time spent on writing book chapters –which often require so much more effort and time than journal articles as they are often open-ended and collaborative– but then observing that they don't seem to 'count' as much as journal publications in T & P reviews, has been

*disconcerting. And recognizing how our community's most prestigious journal – JEE – doesn't have the impact factor that leading engineering journals have, so whereas in the EER community a JEE publication may be a career high, in our engineering community, where we're located and assessed, a JEE publication is accorded less status than a publication in a leading technical journal. These measures are like apples and oranges for engineering versus EER. Noticing that service doesn't 'count' as much – it seems much more like a check mark in T & P; yet as an EER community member who loves and is trying to grow the field, I do so much national and international service, and as a social scientist (and maybe as a woman?) who cares about EDI and Truth and Reconciliation (and who (cynically) doesn't have a side hustle like a consulting company), I put a lot of time and effort into our department, faculty and university committees, and national and international EER communities, and yet these efforts do not weight as heavily as research publications, research dollars, and number of students. And because I am an engineering EDUCATION researcher, I also put time and effort into teaching – constantly redesigning my courses and designing new courses to advance Truth and Reconciliation. And then feeling disappointed when no one pats you on the shoulder and tells you, "*Good job," I really appreciate what you are doing – you're making a difference! *And instead, feeling overworked and underappreciated and like you want to quit. Yikes! This is dark* ☹ *But it strikes me that I came into this work, this field, into academia due to my passion for research, my commitment to make the field and students' lives better, my love for learning, and yet, the 'benchmarks' for achievement in this environment do not align with that motivation, and rather seem to require strategy, ruthlessness, and self-centric achievement. It seems to me that my motivations for being in this space don't align with the requirements for existing/surviving/thriving in this space.*

What have you done to enhance the visibility and capacity of EER?

- *Aim to do "good" – authentic, honest, caring, important, valuable – research work*
- *Mentor my colleagues as I was the first to go through T & P as an EER faculty member (however, I worry that my overwhelming anxiety about achieving T & P when I joined the faculty and resulting work pace are perhaps more damaging than helpful for them)*
- *Help my colleagues find and mentor students and seek and write grants – working often collaboratively with them to build this capacity*
- *Mentor undergraduate engineering and graduate students*
- *Build the profile/identity of our department and engineering education research – but also fight the misinterpretation or misunderstanding of our department and field*
- *Write and seek and apply for a variety of funding – from internal to external, provincial, national, and awards*
- *Present and network at conferences, collaborate on book chapters and in research projects with a variety of people/scholars*
- *Join national and international networks and organizations aiming to build EER capacity*
- *Offer workshops to build EER capacity in our national and international communities*
- *Write about the development of EER in Canada*

Figure 6: Narrative 5- Dean of Engineering trained in Engineering & Public Policy (United States)

Narrative 5: Donna Riley—Smith College, Virginia Tech, Purdue University, National Science Foundation, and University of New Mexico

Who are your EER people and how have they supported your proud moments in terms of your research?

SO MANY!

Early on when I started doing engineering & social justice work:

- *Rich Felder told me there was a CAREER award program in engineering education and encouraged me to submit my idea about pedagogies of liberation in engineering*

- *Also, I had a lot of encouragement from outside EER – social science colleagues at Smith and elsewhere*

LEES (then LED) quickly became my academic home in ASEE:

- *Gary Downey, Amy Slaton, Atsushi Akera, Alice Pawley, Erin Cech, Sarah Pfatteicher, & so many others were there to provide opportunities to think about how things could be otherwise at ASEE, in engineering education, and so on….*
- *George Catalano (whom I met through LEES) and Caroline Baillie hosted the ESJP community and Caroline in particular provided the opportunity to write the book Engineering and Social Justice.*

Shared PhD Advisor:

- *Cindy Atman was critical in my development in part because we shared a PhD advisor (almost a decade apart), but I was able to see how our training in risk perception & communication could translate to EER work.*

Feminist Pedagogy conversations:

- *Susan Lord, Beth Eschenbach, Alisha Waller & others were convening feminist pedagogy conversations c. 2003-4 and welcomed me into their network*

Emerging PhD Programs:

- *Later, the emerging PhD programs at VA Tech and Purdue provided additional community, support, and opportunities.*

Where does EER live in your institutional context(s) and how did this proud moment land?

My institutional context has changed 4 times, but here are some vignettes:

Smith

Though I was the only faculty member to come up for tenure with a CAREER award in hand, and they had strongly emphasized the importance of seeking if not obtaining a CAREER award as part of our development as assistant professors, there were questions about whether it should "count" for tenure at Smith because the topic wasn't "Real" engineering. I've written about this experience various places including in Rigor/us. Ultimately, they decided to count it, but it was not without a fight. My proud moment (being a trailblazer of some sort) was not rewarded through T&P and in fact it was a detriment. [Note: I had struggled at mid-probationary review as well because my work was seen as "too much social science" because it involved working directly with environmental justice communities in collaboration with both social scientists and community leaders. Senior colleagues made me obtain external letters for mid-probation review, which no other faculty had to do. These letter writers had to be from top engineering schools. The letter writers vouched for me and for my work. I am grateful that these leaders made my continuing career possible; at the same time I am acutely aware of the role white privilege played in this result, as I personally know female colleagues of color similarly engaged in environmental justice work, who also had prominent white male colleagues vouch for them, who were denied tenure or experienced other kinds of career setbacks.

Virginia Tech and Purdue

I served on the College level T&P committees as Interim Head and Head respectively. I had the experience of soliciting external letter writers for candidates for promotion to associate professor and full professor and advocating successfully for over a dozen cases total over the years. I also became a frequent letter writer at a time when there were very few full professors at institutions deemed suitable for letter writing (e.g., R1; ranked top 25 or top 10 in US News; or in Purdue's case, AAU). I relied heavily on a small set of letter writers and learned a number of tactics deployed:

- *A paragraph about how conference papers counted – describing the selectivity of certain divisions within ASEE*
- *Explaining the limited number of scholarly venues – there was JEE (but JEE had a residence time for review around 2 years at that time and it was extremely selective, categorically excluding (or nearly so) papers using certain methods (e.g., qualitative methods) and certain topics (e.g., ethics, DEI, etc.). There was a presumed unwritten expectation that an article in JEE was required for tenure, but for some faculty that wasn't going to happen based on the topic or methods of their research. For those faculty, other journals, books and book chapters, etc. became very important.*
- *At some institutions it is required to "tier" journals – deciding a list of journals that are considered top, and others less so. This has been very difficult in EER especially because there are certain journals that exist for certain types of research (e.g., K-12 EER) that don't "rate" in terms of citation rates or exclusivity but are nonetheless the "right" venue for certain kinds of work.*
- *A paragraph on h-index and citation rates is usually important to include for universities that rely on those data. I kept a list of prominent scholars with low h-indices at the time of their promotions so I could make favorable comparisons.*
- *Discussions of impact beyond citations became more important over time and ways of describing that impact became a kind of art – number of people a scholar reached though workshops; how their ideas traveled, etc.*

University of New Mexico

What have you done to enhance visibility for EER in your context(s)?

- *We had a successful RED grant in our School, and I have amplified the department's accomplishments and sought to scale up their strategies school-wide.*
- *I wrote a memo for T&P clarifying how interdisciplinary work including EER counts (i.e., it should not be discounted in any way).*
- *We established a Center for Engineering Equity based on an NSF BPE grant we received. The grant was cancelled by the current administration, but the work continues.*
- *I inherited and continued a position for Special Assistant to the Dean for Learning Sciences and added a Special Assistant for Educational Innovation*
- *I have hired EER faculty, postdocs, and administrators to expand our capacity for EER.*

What constitutes EER excellence?

- *A coherent approach to research connecting theoretical frameworks, methods, and research questions. I want to be especially clear here that this approach is intentionally broad to allow for theories, methods, and questions from a variety of disciplines. There have been many attempts to define excellence (perhaps one of the most popular being the Jamieson and Lohmann 2012 report), which proposes a kind of praxis loop where problems emerge from the community, sparking research questions, with findings creating change in communities, generating new questions, etc. But how to measure impact has been difficult for our field especially with the imposition of more positivist framings and metrics. Rigor/Us discusses these tensions. I do think things have moved forward a great deal, with a broader set of methods and metrics now more welcome in EER.*
- *How we measure impact matters a great deal. I think we need a framework that is realistic about how change really happens, and doesn't happen, regardless of the quality of the research driving a change effort. Who gets read, what gets attention, etc. is all socially mediated in ways we don't account for and should. The problem of targeted harassment, and recently more direct governmental censorship, has made it harder for certain ideas to travel at all. I think we need new ways of valuing scholarship that is rooted in greater clarity about what our scholarship is for – not just changing engineering education, but perhaps something more. Returning us to the values of higher education, or of the engineering profession? Shifting those values in important ways in these times?*

Together, these five institutionally located narratives experienced by tenured and tenure track EER professors navigating T&P processes in ten institutional contexts shed light on the motivations, barriers, and supports faced by engineering education researchers. Before we discuss cross-case themes, we honor the specificity of our individual paths by summarizing our five contextualized cases. Please see Figure 7 for a condensed response to the grammatically awkward question—"what are these five cases, cases of?"

Figure 7: Five Contextualized Cases of Engineering Education Research

Cindy Finelli*: Tenured, classically trained engineering professor located in a traditional department who has found ways to gain acceptance for EER contributions through externally recognized markers of excellence like successful NSF grants. Her leadership has involved mentorship of junior colleagues and regular efforts to publicize EER excellence, translating high quality EER contributions into metrics understood by her colleagues. She has engaged in NSF-sponsored work to develop and disseminate strategies for early career engineering education researchers, as well as others, to articulate the value of their work to multiple audiences, including T&P committees.*

Cindy Rottmann*: Social science trained tenure track assistant professor in an EER unit with non-budgetary cross-appointments to two engineering departments and one education department who has experienced international and national recognition through "best paper" awards and federal Social Science/Humanities grants but has struggled to translate these external EER metrics into institutionally recognized markers of research excellence.*

Justin Hess*: Recently tenured EER associate professor who completed his PhD in EER, with previous degrees in engineering. His collectively framed interdisciplinary research studies have been socially and educationally impactful, but he has struggled to make the research he conducted at a teaching/service institute count towards his T&P package at a larger, more traditional university with an established EER program.*

Jillian Seniuk Cicek*: Tenured EER associate professor who completed her PhD in EER, with previous degrees in visual arts, creative writing, and education. Her research on and commitment to EDI and Truth and Reconciliation and her work to develop capacity in EER have resulted in high levels of emotional labor without the corresponding recognition of engineering colleagues with traditional research labs and lucrative private consultancies. The need to be strategic and calculated for T&P run counter to her collaborative and inclusive community-building approach.*

Donna Riley*: Tenured Professor, Dean, and EER trailblazer trained in engineering who has felt supported by many EER scholars while facing an uphill battle to get critical scholarship recognized as engineering research. While her institutional capacity building efforts have consistently made space for other EER scholars to find their respective footing, she has continued to be penalized for doing social justice work in service of local activist communities.*

Discussion: Conditioned to be Cosmopolitan while fighting to remain Locally relevant

Early in the process, as we were drafting our abstract for this paper, we identified three barriers faced by EER professors applying for tenure in engineering: (1) having our research miscategorized as simply "good" teaching, (2) the use of individualistic metrics that under-value the interdisciplinary EER collaboration, and (3) longer research ramp-up periods due to inequitable funding opportunities, time intensive interdisciplinary training experiences, high pre-tenure administrative service loads, and smaller labs. Since this first meeting, we have reflected

on our five EER narratives, leading us to identify more textured themes. Instead of sharing a list of categorical constraints we all face, we identify a few plotlines subsumed by a larger story.

The overarching story emerging from our analysis blends Gouldner's (1957) seemingly dichotomous social identities, "cosmopolitans" and "locals". While we follow our own paths, our experiences as disciplinary outsiders have conditioned us to accept a cosmopolitan identity to some extent. Still, we have all found ways to remain locally relevant, partly by choice, and partly because our job security depends on it. This is not a story about divided loyalties or even about rogue career exploration. It is a story of five EER scholars transcending dualistic professional identification by necessity. We have sought support from external networks of EER experts because they have the necessary training and expertise to assess and scaffold our work while also carving out space for EER at our home institutions because our job security and impact depend on it. Our career paths blend cosmopolitan and local identities, demonstrating that they are neither mutually exclusive nor oppositional in the lives of interdisciplinary scholars. They are the inside/outside realities that bring insight and creativity to our work. In the paragraphs that follow, we share three inside/out plotlines demonstrating how we navigate engineering research spaces, identify two important structural supports enabling us to do our work, and share five systemic barriers that intensify our labor. We conclude with four overlapping plotlines related to our EER advocacy, as we set out to make space for ourselves and the next generation of EER scholars.

Inside/Out: Navigating engineering research spaces from the periphery

The experience of sitting both inside and out of our respective communities of practice was a key feature of all five narratives. We shared: 1) a sense of being outsiders at home but leaders abroad, 2) the emotional tenor inherent in managing hope and rage, and 3) an appreciation that EER progress is not linear. First, all five of us have experienced a warm welcome into multiple interdisciplinary EER networks that have helped us view our research as credible and impactful. We have also, to varying degrees, returned home to have these proud moments evaporate after being celebrated as a receding news event. While some of us have experienced insider status at home, all five of our narratives include details about living on the periphery of engineering culture and norms. Second, most of our narratives had a *hope and rage* feel to them; standing on the margins, knowing the work we do is meaningful while recognizing it can also be exhausting to repeatedly explain ourselves. We shared our passion for our EER commitments while also being honest about the emotional labor involved in the ongoing translation and explanation of our work. We experienced hope when colleagues agreed to mobilize our findings in their classrooms and disappointment when our community-driven projects failed to count as research. This simultaneous sense of hope, excitement, disappointment and rage reflects non-linear notions of progress – our third plotline. We have felt hopeful about a cultural shift within EER, as the highest impact factor journal in our field (*Journal of Engineering Education*) now accepts a broader set of methods. In some cases, our research has even been translated into curricular changes in our home departments, resulting in social impact paired with professional satisfaction. Both indicators suggest linear progress with time, but as is often the case with educational reform, we have also observed a pendulum effect catalyzed by regressive policies at the national and global scale. Sweeping anti-intellectual, anti-equity executive orders, particularly in the U.S., but also in Canada, have resulted in the cancellation of many of our projects, eroding the credibility we once experienced in some of our institutions (Seniuk Cicek et al., 2025). Funding

opportunities associated with DEI-affiliated research[2], such as the National Science Foundation's Racial Equity in STEM Education[3] and Ethical and Responsible Research,[4] have been drastically cut back, teaching us that progress in EER, like in many academic fields with ties to social movements, is rarely linear and not always progressive.

The three overarching plotlines we have experienced—outsiders at home/leaders abroad, the emotional hope/rage tenor of our narratives, and the non-linear, oscillating progress of EER—live in the same orbit. Periods of receptivity to socially impactful change interrupted by regressive political climates would cause anybody to emote, but this natural human response to being shut down is often read as personal instability, especially in a disciplinary culture that values rationality and epistemic neutrality (Baillie, 2021; Beddoes, 2024; Blair-Loy & Cech, 2022; Carrigan & Bardini, 2021; Cech, 2013; Downey, 2014; Faulkner, 2000; Holly, 2020b; Nieusma & Blue, 2012; Pawley & Hoegh, 2011; Riley, 2014; Riley et al., 2020; Riley & Lambrinidou, 2015; Rottmann, 2024; Rottmann et al., 2021; Secules, 2019; Seniuk Cicek & Friesen, 2018; Seniuk Cicek, Masta, et al., 2023; Seniuk Cicek, Paul, et al., 2023; Seron & Silbey, 2009; Slaton & Pawley, 2018; Slaton & Riley, 2024; Smith, 2021). The main point underlying these three interwoven stories is that our social identities are blended properties of the systems in which we work and our responses to these systems. One way to make these systems visible is to identify the supports and constraints we encounter as we run into them.

Supports: EER Communities of practice and universally recognized metrics

Two key supports that build capacity for our work include: 1) affirming EER networks and 2) success with traditional awards, honors and grants. First, the most powerful EER support has involved finding our people. Communities of engineering education researchers have helped us frame our work in an asset-based way, taught us practical EER advocacy strategies, and reduced our feelings of isolation. Even the process of reading each other's narratives felt supportive and familiar. At our third meeting, several of us noted that the experience of reading one another's stories helped us feel excited by what we could accomplish as EER advocates, opportunity-makers, and researchers who care about the social impact of our work. This moment of recognition reflected the strong relationships we have each built with EER communities of practice through the American Society for Engineering Education (e.g., LEES, ERM, and LEAD Divisions), the Canadian Engineering Education Association (CEEA-ACÉG), the International Network of Engineering Studies (INES), the European Engineering Education Association (SEFI), the Engineering Social Justice and Peace (ESJP) network, the Research Engineering Education Network (REES), and other EER associations. Community building has helped us advance collective goals and initiate novel pursuits, fostering interdisciplinary connections. Early in our careers, many of us experienced encouragement from senior EER champions who believed in us and viewed our work as an asset to the field. They were not only encouraging in tone, but also helped us locate relevant awards, invited us to join discussion groups, and introduced us to interdisciplinary teams of engineers and social scientists who supported our theoretical ideation process without first having to provide an explanatory comma about why these topics mattered. We met trailblazers who opened spaces for us, found colleagues and

[2] https://www.commerce.senate.gov/2025/2/cruz-led-investigation-uncovers-2-billion-in-woke-dei-grants-at-nsf-releases-full-database

[3] https://www.nsf.gov/funding/opportunities/edu-racial-equity-racial-equity-stem-education/506103/nsf22-634

[4] https://www.nsf.gov/funding/opportunities/er2-ethical-responsible-research/505693/nsf24-604

friends in emerging PhD programs, and connected with national and international EER communities. In a few cases, interdisciplinary, multi-institutional project teams seeded by these networks were critical for helping us conduct high-quality, high-impact investigations.

The second key support for producing high-quality EER research, involved local validation for success with traditionally recognized metrics of research excellence. Securing federal research grants (e.g. NSF Career and Revolutionizing Engineering Departments grants, and SSHRC Insight Development and Partnership Engage grants), winning peer-reviewed best paper awards, and/or publishing our findings in high-impact journals helped us translate EER excellence into recognizable metrics at home with considerably less energy than much of our day-to-day capacity-building work. These traditional measures of excellence often, though not always, lent our research credibility in the eyes of our engineering colleagues. Still, even with these seemingly indisputable measures of excellence and supportive EER communities, we continued to experience workplace constraints tied to normative engineering practices.

Barriers: Normative benchmarks intensify our labor

Five interwoven barriers worked against straightforward recognition of our research portfolios: 1) targeted harassment for researchers leading justice-driven projects, 2) limited research infrastructure in teaching-heavy units, 3) normative engineering values underpinning universally applied research benchmarks, 4) metrics that undervalue EER achievements, and 5) invisible labor required to make up for these constraints. First, the problem of targeted harassment against justice-driven projects, recently compounded by direct government censorship (particularly in the U.S.), has made it nearly impossible for certain ideas related to social justice, DEI, or Truth and Reconciliation (TRC, 2015) to travel at all, let alone be considered groundbreaking research. While this systemic mode of discrimination impacted most of us, it was intensified for many of our racially minoritized colleagues and students whose career mobility has been blocked or terminated, particularly when their research is rooted in community-based activism. Second, even for those of us with relatively secure positions, many forms of structural inequity make it more difficult to build thriving research programs when compared with our engineering colleagues: fewer high ranking journals willing to publish EER findings, fixed institutional status hierarchies restricting which universities count as comparable peers, limited research infrastructure in teaching and service heavy units, and restricted eligibility for PIs interested in EER applying for science and engineering grants.

Third, underpinning each of these barriers is a set of normative values tied to universally applied T&P engineering benchmarks. These values and preferences include individual over collective, technical over social, productivity over quality, tables over narratives, quantitative over qualitative, practical over theoretical, and objective over interpretative. These normative values not only define metrics of success in traditional engineering departments, but they have also historically dictated the kinds of topics, methodologies, and paradigms used to assess EER studies within our own publications.

A fourth common barrier many of us have faced is the systemic undervaluing of EER research. Scholars in education and more recently in engineering education have conceptualized this perceived inferiority as a “deficit mentality” (Dei & Holmes, 1995; Mejia et al., 2018). Often this durable mindset is rooted in the false dichotomies listed above. For example, many of us

experienced the denigration of interdisciplinary and collaborative work, statements about best paper awards in EER signaling lower quality standards than similar awards in traditional engineering disciplines, EER-based CAREER grants not counting as "real" engineering research, socially theorized inquiries reduced to "soft skill" acquisition, concerns about having too much social science in our research, characterization of critical theory as an unprofessional outburst rather than a conceptual contribution to a well-established body of knowledge, and partnerships with Indigenous or activist communities viewed as a detriment to scholarly productivity.

When woven together, these four constraints require us to do more work to get less far (in conventional but also material terms), leading to our fifth barrier—invisible labor. For example, we need to fight to count the research we do as "real" engineering research but are then characterized as difficult for daring to mount this Sisyphusian fight. In the words of Camus, "one must imagine Sisyphus happy." We meticulously provide additional proof of research competence for probationary or T&P review purposes but are then told to stop being so unnecessarily wordy. When our projects are underfunded, we step up and add our labor to the pot, conducting data analysis and completing writing tasks typically done by graduate students in our colleagues' labs, and are then penalized for having lower productivity rates. The limited recognition of our research foci spills over into our teaching loads. In contrast to our colleagues whose research programs are often extensions of core engineering courses, our research only periodically makes it into temporary "special topics" elective courses. Those of us who have had the good fortune to develop "special topics" courses related to our research put time, effort, and heart into our pedagogical preparation, only to find the courses drop off the calendar in a year or two. These examples of invisible labor required to make up for the structural constraints illustrated by our narratives consistently work against straightforward recognition of EER research contributions at all career stages. This impact is cumulative, resulting in delayed promotions, missed recognition, and decelerated career advancement.

Advocating for the field, making space for the next generation

The political, institutional, and disciplinary constraints we discussed above have added to our respective workloads, but they have not stopped us from engaging in EER advocacy. Our final theme describes our ongoing efforts to support EER excellence in four overlapping ways: 1) driving formalized change through our institutions and offices, 2) reframing normative thinking about research excellence, 3) measuring the impact of our work, and 4) mentoring the next generation.

The five of us occupy different positions in our respective faculty hierarchies, from pre-tenured assistant professor to Dean of Engineering, but we all hold formalized leadership roles in EER. In several cases, we have also come from careers in other fields, which have informed our research contributions. When possible, we use our offices and positions of decision-making authority to lead and formalize change. We have done so by sitting on or chairing EER hiring and T&P committees, clarifying how EER metrics align with traditional ones, and formalizing policies that support interdisciplinary research, so they do not disappear with the outgoing chair or dean.

Second, we have reframed dominant ideologies, often in our research, but also in our everyday conversations with colleagues, weaving EER threads into conversations about engineering

research. Recognizing that EER is confusing for many, we have found ways to work it into our professional relationships by inviting colleagues to collaborate on interdisciplinary grant applications, sharing our findings with them through guest lectures in their classes, and sometimes, if we know them well, gently poking fun at positivist assumptions that arrive with the force of truth.

A third way we have advocated for the field has been by recognizing the centrality of social and educational impact to EER research, thereby acknowledging the need to communicate that impact to others. To do this, we take a philosophical approach to EER—asking not only how to do EER with disciplinary integrity, but also why we do it. What are we trying to accomplish as a field? What kinds of change count as change, and how do they happen, realistically, in higher education and professional practice? Studying educational change processes is part of the field, though not always valued by EER journals. Thinking about these questions strategically with one another and with our engineering colleagues may help us transcend the instrumental use of EER as faculty-wide tool to pull out every four or five years for program accreditation purposes.

Fourth, all five of us have shared practical strategies for supporting junior colleagues and graduate students. We have nominated them for research, teaching, and leadership awards, served as formal and informal mentors, and helped them navigate the T&P process, teaching them how to advocate for their research and establish its legitimacy. In fact, this paper is an example of four senior colleagues saying yes to providing this kind of support for a junior (professionally, if not by age) colleague. Senior members of our team have written letters for EER professors going up for tenure to explain the ways in which EER excellence shows up outside of traditional engineering benchmarks, chairing and sitting on T&P committees to help departments and institutional leaders appreciate the unique contributions of EER scholarship. Each of these action items is so central to our work that many came up when we reflected on our proud EER moments at our second meeting. Together, these four examples of EER advocacy demonstrate our commitment to broader social impact, as recommended more than a decade ago by Jamieson and Lohmann (2012) in their large-scale EER study, *Innovation with Impact: Creating a Culture for Scholarly and Systematic Innovation in Engineering Education*.

Conclusions, Implications, and Next Steps

Together, our five narratives illustrate a collective struggle to remain locally relevant with support from external EER communities of practice. We have not always been successful at translating EER topics, methodologies, and impact into language that lands firmly in the hearts and minds of traditionally trained engineering colleagues, and yet we persist. We do this not only to ensure our own job security, but also to carve out space for a field that we believe truly matters. Conversations about T&P are often about how to play the game strategically and tactically today, so that you live to see another day, but our five interwoven EER narratives in ten institutional contexts tell a different story. They tell a story of collaborative, interdisciplinary, theoretically driven research for social, educational, and professional good. We tell these stories and do this work for ourselves and for the next generation of engineering education researchers whose teaching, research, and social impact goals will move the field and the many people in it,

forward. We share these five narratives to foster innovation among EER scholars who imagine different futures than the path laid out for them now.[5]

Acknowledgments
We wish to acknowledge the larger engineering education community whose members have shared in our local, national and international struggles to launch a socially impactful field of research. Thanks to our many mentors, named and unnamed, recognizing with Rosemary Radford Ruether that "No one can affirm an idea against the dominant culture unless there is at least a subcultural group that gives people both the ideas and the social support for an alternative position."

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[5] This paper is about T&P which only impacts tenure-track faculty members in EER, but we wish to acknowledge the importance of considering what success looks like outside of the tenure-track, such as for teaching stream colleagues, full time staff researchers, institute directors, co-curricular program leaders, and educational administrators tasked with DEI, mental health, and accreditation. What might success look like for our colleagues outside of the tenure track? As a field living on the periphery of engineering, we need to consider what success looks like for these other roles, especially since there are many more of them, often in even more precarious positions than the ones in which we find ourselves. Some of us have direct experience holding such positions prior to our current roles, and have noticed that as budgets tighten, tenure track engineering education researchers often find ourselves in roles off the sides of our respective desks, invalidating the work of colleagues whose full-time roles are being rolled into an under-resourced collective responsibility.

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