

Beyond the Performance of Quality: Arguments and Advice for Making Meaningful Contributions in Engineering Education Research

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Introduction:

Engineering education research (EER) writing has come to emphasize technical rigor and quality of research methods and required paper sections (e.g., positionality, lit review, quality measures, sampling, recruitment, limitations, etc.). This underlying emphasis persisted regardless of prominent critiques of rigor and pivots in terminology. While higher quality research writing has helped the field progress in building knowledge, the “technically” rigorous work of academic research methods is positioned above the collectively “social” work of scholars communicating about education. This positioning encourages box-checking without a clear, purposeful argument.

Rather than rigor and quality, we offer alternative ways to think about research writing: *purpose* as the underlying reason for writing and the aim of the work, and *contribution* as the extent to which the knowledge and understanding of the topic has shifted (aligned with the paper’s purpose). Purpose is selected by the writer, while contribution is primarily assessed by the reader. Further, *authenticity* is the genuineness of an argument to represent the perspective of the author, the research study, and the engagement with the literature and scholarly community. Authenticity is difficult to assess formally but provides a counterpoint against superficial performance of quality.

For the two coauthors in our roles as authors, readers, reviewers, and editors, contribution and authenticity are the primary criteria we write and read for. We can overlook idiosyncrasies regarding typical EER paper content if the overall argument is compelling. Perhaps that stems from our interdisciplinary backgrounds—outside of EER are many compelling contributions to knowledge that do not adhere to EER journal format. Some papers just argue, others just inspire, many don’t even have methods sections. Having 100% of the necessary component parts of a research paper is neither necessary nor sufficient for creating an important contribution.

As coauthors of this paper we are aiming to further a dialogue on the authentic purpose and contribution of EER writing. We initiated this paper in part as a provocation to EER scholars to suggest a redirection of energy, and in part to provide a window of guidance to help move in that direction. To help motivate the provocation, we begin with some further clarification of our own author perspectives and positionalities. As paper process, we engaged in a collaborative and dialogic inquiry to spur generative dialogue; we now share the tenets of our exchanges, which include contribution, the struggle for legitimacy, systematization, rigor, quality, and gatekeeping. We also highlight alternative considerations of quality centered in contribution, an ethic of care (Gilligan, 1982; Tronto, 1998), and authenticity. We conclude with advice to the community, particularly for early career researchers and authors.

Author Perspectives:

Stephen: Initially I felt like an outsider to engineering education, having received my PhD outside the list of known engineering education programs. I was more compelled by thinking about education broadly, and later stumbled into engineering education by a combination of my prior engineering career background, the available projects and teaching roles, and where my work was most valuable in

conversation with other scholars. The more I saw that I understood some aspects of classrooms, culture, or equity that other engineering educators or researchers did not, the more I leaned in that direction. Having recently become tenured through an engineering education department, been appointed on a journal editorial board, and realized that somewhere along the way my work became a staple of engineering education syllabi and methods section citations– I no longer consider myself an outsider *per se*. But, I still think I sometimes work against the grain of the community in some methodological and epistemological ways. I’ve always been motivated by a drive to have an original voice and contribution that is authentic to the ways I see the world—it’s one of my favorite potentials in the career of academia. Nowadays, I try to distill lessons about creating meaningful and impactful engineering education research for my own graduate students and other earlier career researchers. This paper topic stemmed from one of those discussions—articulating how all the pieces of a research paper can fit together to create an outcome bigger and more influential than the sum of its parts.

Jill: When I was at Purdue taking my MFA in Creative Writing in the mid-90s, we ran weekly writing workshops where we critiqued each other’s fiction and poetry, identifying the “heart” of the work. That was what we were taught – to be drawn to the heart of the writing, found in the kernel of the message that needed telling, needed unfolding, a seed that would germinate into the petals of that unique flower. Sometimes we disagreed; we argued for the heart we felt. I also recall consciously struggling to separate the heart that may be connected to my way of knowing the world, and the heart that existed in the author’s work, unique to them and the story they were trying to tell. I suppose that was my first somewhat unconscious struggle with epistemology.

It was messy work. Pages and pages of words with, at times, barely a glimmer of that kernel. So much rewriting, so much birthing to work that seed into its final flower. And of course, in the end, so worth it! Sometimes, works unrecognizable from the original manuscript would emerge; other times, it was more polishing and making space for and coaxing that kernel to its full bloom. It was complex, frustrating, emotional, messy work that often felt directionless, drawing feelings out of the recesses in the cacophony of words so they could resonate across the pages and into the heart of the reader. But it was authentic work. It was beautiful.

Now, in the world of academic writing, in a field which has been characterized for me – and others – as a battle for legitimacy, I have found myself – at times – reading the publications in our field’s few engineering education journals and lamenting the loss of that heart work. I find myself (at times) reading work that rather lacks heart, and maybe a deeper, compelling purpose, that seems to rather be purposed to advance methods or methodology. Work that is so intent on being procedurally perfect, “rigorous”, that it loses track of – or never really authentically considered – what questions are being asked, what knowledge is being uncovered, what and whose story is being told. And why. Why that story is being told. Which is why, when Stephen presented his ASEE paper on honest methodologies last year, and then reached out to me after on a separate matter, I jumped at the chance to tell him how meaningful his paper was to me, and we began dialoguing on what has turned into this current muse.

Stephen: The honest methods paper (Secules, 2025) Jill mentions also grew out of trying to distil my own writing lessons through conversations with my graduate students. I was tired of reading methods sections that all sounded the same and revealed none of the interesting context of a paper. I wanted my students to

realize the difference between methods writing that has a genuine function to inform the reader about a study's context and methods writing that has a box-checking function to perform one's knowledge of methods conventions. I reviewed typical parts of a methods paper (e.g., data collection, data analysis, positionality, limitations, ethics) and contrasted what could become performative about that section versus what its genuine function is. Ironically, the paper received some challenging reviews within the Education Research and Methods division because, as advice about education research methods, it did not adhere to any particular accepted paper form.

Paper Process

Our paper emerged out of a combination of our scholarly publishing and informal dialogue about it. As mentioned above, Stephen has been making a theme of his writing lately to comment on and push the field regarding methods in ways that can provide guidance for early career researchers and can challenge the practices of established researchers (Secules, 2025). Jill wrote to Stephen about this prior paper argument and the ways it resonated with her. We realized we approached the topic from both divergent and convergent perspectives, and that reflecting together could extend and validate the prior thinking to be relevant to a wider set of the community.

We met regularly to reflect and have dialogue around the challenges with the EER community. We drew on the idea of collaborative inquiry (Bridges & McGee, 2011) and dialogic inquiry (Frank, 2005) to create reflection areas for us and responded to each other in a Google doc document. As new topics of reflection emerged, we added them as possibilities and responded to each other in text. We wrote informally and personally, including specific life and professional experiences. To write this paper version, we formalized those dialogic reflections into more formal prose, keeping the option for directly quoting our dialogues where the immediacy and informality was useful. We abstracted some of our direct life experiences to remain collegial and to widen the applicability to the community. We consider this contribution as spurring an intellectual, generative dialogue (Gunnlaugson, 2006), similar to the dialogue we spurred with each other. We do not claim to have studied the topic to have arrived at either objective truth or a universal approach to the complex work of conducting and representing EER. We hope the contribution finds its utility within the broader community, to prompt responses, disagreements, or clarifications and to help bring about new forms of disciplinary representation and legitimation.

Reflective Findings

The following findings are organized around topics we reflected on together and formed into a series of inquiries or provocations.

Contribution

To illustrate the concept of contribution, Stephen shares a figure (see Figure 1) to conceptually guide discussions with his graduate students. He offers a metaphor of taking the reader on a journey with the writing, starting from the knowledge on the subject at the current moment. The reader travels from there via each section of the paper, arriving back up near the top to the purpose/premise, but some distance further to the right. That additional distance they moved from the starting point is the measure of the work's contribution. Considering the entire landscape of engineering education knowledge, including theory and practice, the contribution is a measure of how the world is different once the paper has been put into the world.

If an author starts from the premise (as many in EER do) that there needed to be more work on a subject, and by the end of the paper they have concluded that the research added one additional study—that is an incremental contribution. When making an incremental contribution, authors typically follow the rules and conventions of the research community and present some small addition that helps our understanding. Perhaps the world is different because there are more participant themes that largely confirm the literature. Perhaps the world is different because we have applied an existing theoretical framework to a new population and confirmed what many already suspected or experienced about the topic.

If the paper traverses a further intellectual distance, providing the reader with insight, convincing, persuading, elucidating, inspiring, etc.— that is a transformative contribution. While not every paper needs to make a transformative contribution, we think aiming towards transformation is more worthy of our collective discipline’s time and energy. When making a transformative contribution, a researcher may need to break research conventions, go beyond traditional ways of viewing data, take on bold new theoretical frameworks, etc. The world is different because there is a radically new way of experiencing the world, an important new finding or way, a methodological approach or study design that others have not yet tried. We think for qualitative research work, a transformative contribution requires thinking about the theoretical and pragmatic aspects. What does this research finding really mean for other people in the community? How can the researcher help the reader experience something about their work, research, or daily lives that they have not experienced?

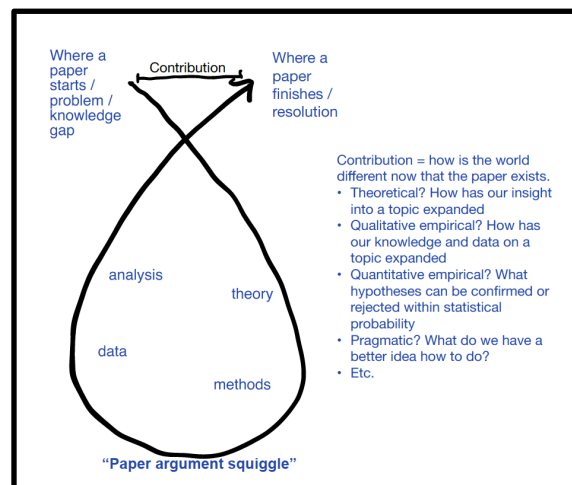


Figure 1: The Paper Argument Squiggle

The metaphor helps authors think from a reader’s perspective and helps them remember or imagine what a reader knows and understands, what they do not know, what is convincing for them, and what is exciting for them. Thinking in this way can help writing become more accessible, cohesive, and compelling. A transformative contribution.

Struggle for Legitimacy

What preoccupies engineering education researchers beyond making a useful or insightful contribution? Looking back at the development of engineering education as a field, we see a struggle for legitimacy (Coso Strong et al., 2020; Deters et al., 2023; Klassen & Case, 2019; Klassen & Case, 2022; Seniuk

Cicek et al., 2023; Zheng, L., & Wei, S. 2023). In the United States, engineering education leaders sought to formalize the national organizations, journals, conferences, and PhD processes that define the field (Froyd & Lohmann, 2014). They wondered aloud if engineering education was a discipline, a field, or a community (Jesiek et al. 2014). They created taxonomies of shared search terms (Finelli et al. 2015). All of this work helped legitimize engineering education, but it is also inside baseball¹ – the system validating itself.

Legitimacy is a concept more underlying quality and rigor than contribution or purpose. A discipline, community, or field that focuses self-referentially on ensuring the definition of itself is valid, has not necessarily made the external contributions that make the discipline worthwhile. We think legitimacy is often underlying the sense of pedantic box-checking that can accompany some engineering education review and publication processes. Each player inside the system wants to ensure they are legitimate, enforcing (sometimes unnecessary) rules is one way to ensure this.

On the one hand, we think there was an era for validating the field's legitimacy, and, at least in the United States, we are past that insecure adolescence and in a stage of maturity where we can be bolder about EER's purpose and contribution. On the other hand, the national climate towards STEM Education, diversity and inclusion, liberal education, and academia / academics suggests engineering education could be as fragile as ever. PhD program departments have been dismantled (e.g., Clemson) and tenure homes reassigned. Rather than caused by one specific political moment, this uncertainty perhaps shows us that the legitimization we built for ourselves was never quite as solid as we hoped (Seniuk Cicek et al., 2025).

In the face of this uncertainty and dismantling, the need for legitimation is not vestigial or theoretical. Yet, from the start, we did not need to focus the legitimization of EER solely on the traditional metrics of the system—journal papers, grant dollars, PhDs, tenure lines. There was also the option of having the legitimization of EER rest in its meaningful contributions to the practice and theory of engineering education. If we embrace the uncertain landscape and point ourselves to the next most meaningful and important contribution, we can keep making progress.

Authenticity and Form

A way we see of pointing ourselves in the direction of meaningful contribution is to be authentic to ourselves as researchers, educators, learners, and people. As coauthors, we began a dialogue about authenticity as opposed to a performance of rigor or quality research. The essence of writing is communication: communication to an audience, communication to a purpose, communication with a particular format or style. While the forces of legitimation can push us to pay attention to particular rules for format, the essence of the communication is more fundamentally to an audience with a purpose.

Jill finds some major engineering education journals' emphasis on methodological description constrains authenticity. Stephen finds creative freedom in the same constraints but notes how often others shift towards only following the rules of methodological description and not finding the authentic story within it.

¹ Inside baseball is an American term for an internal concern that would not be as interesting or legible to outsiders.

Consider the main required parts of a traditional research paper: literature review, theoretical framework, methods, findings, discussion, conclusion. Similar to Stephen's prior argument (Secules, 2025), each of those has an authentic purpose, and a potentially performative ulterior motive. A literature review can be an authentic representation of the literature, its contexts and contributions, to position the scholar's new work in conversation with the other scholars. Or, a literature review can make facile observations like "little is known about" the exact niche subject the author decided to write about. A theoretical framework can be a framework the author explores the educative landscape through, connecting both unique insight with a tradition of scholarly insight. Or, a theoretical framework can name drop and cite the most obvious common theory, or not apply it to the methods or interpretations in a meaningful way—an atheoretical theoretical framework section. A methods section can provide meaningful context for the study, elaborating the key details that help a reader make sense of the findings, exposing the messiness of the research decisions, or translate the study to different contexts for replication or application. Or, a methods section can reproduce increasingly prescribed sections—requiring in every paper a discussion of methodological tradition, quality, trustworthiness, positionality, limitations, etc., which could be transposed to any study, such is the generic nature of the writing and the lack of connection to the communicated study (Secules, 2025).

One might argue the rules of format, including the many method subsections, are a baseline requirement for research. Yet, these rules of format are not a baseline requirement for a contribution to education. The coauthors' interdisciplinary backgrounds also span disciplines with norms that may not include a methods section at all, yet publish highly influential papers.

We think both can be true—the form of a traditional journal paper is helpful in some cases, and does not constrain all creativity or contribution. But, the authenticity of the contribution can in fact be sacrificed to form and that is likely rooted in a narrow focus on legitimization that will not, in the end, serve the broader community. If we did away with form and looked only for what motivates us and what moves us, authentically, as writers and readers, we might be better off for it. If this came to pass, we would likely need a new sense of, and approach for evaluating the meaningful contribution of the work, beyond its performance of quality.

Systematization

We realized upon reflection that one of the forces in EER that pushes us away from authenticity is systematization. We have experience with papers that create challenging and influential conversations about theory (Johri, 2010), methodology (Case & Light, 2011), research quality (Walther et al., 2017), or positionality (Secules et al., 2021), in which the authors were wrestling with a complex and messy reality and placing the work in the forms of the community to push forward a conversation. Upon publication, some of that conversation seems to take place, yet pretty quickly many people look to this influential paper as an opportunity to cite it to demonstrate their knowledge of the influential conversation, or to performatively check the box of the perceived convention. The field may be wrestling with complex aspects of positionality, say, but the uptake is a new rule that every paper must have, for example, a one paragraph positionality section with the appropriate citation, or must legitimize their qualitative research using a specific quality framework for evaluating qualitative research.

This systematization is in part welcome and in part troubling. It is welcome, for example, that leaders in the community are recognizing some of the messy realities and influential conversations and trying to promote increased understanding of and through the review process (Holly & Butler, 2025). Yet, the review process can have a disciplining and performative aspect to it, and can lean heavily on perceived conventions and systematizations of the field. This approach to reviewing can too easily lead authors away from their authentic message and meaning, and the responsibility of knowledge production for both the author and reviewer. It seems an author should have the agency to decide how much a particular box checking category will help their message—this is also in the context of their other work, how their authorial voice will be heard in that context, how succinct they want their work to be, etc. The review process selects for rule-followers more than for authenticity. Ultimately the rule-following is a far cry from the initial messy and complex conversation initiated by authors; so, the field appears to progress through the systematization, but in fact does not.

Maybe we would always need a system, and it is the perfunctory systematizing that is the problem. If the system was a holistic intellectual retreading of the meaningful philosophical ground that came before us as we engage in an authentic messy research process, maybe that would break the word “system”, but it could at least become the community’s north star – to live up to that sense of authenticity and meaningful work.

Rigor, Quality, and Gatekeeping

Over the course of the history of EER, there were repeated attempts to define or redefine its boundaries. From the origination of the Rigorous Research in Engineering Education (Streveler & Smith, 2006) came about additional critiques or reframings. Within EER, a reframing of rigor as quality was positioned as an attempt to focus on multiple dimensions of a study— theoretical alignment, practical validity with a real world context (e.g., Borrego, 2007; Jamieson & Lohmann 2012; Streveler & Smith, 2006). Additional formulations in subsequent years attempted to redefine a narrow and quantitative-leaning rigor to include multiple dimensions of qualitative research (Walther et al., 2013).

Riley (2017) prominently connected the focus on rigor to gatekeeping, and connected the diversification of the engineering discipline to the boundary keeping of those in power within it. Davies and Dodd (2002) provided a similar provocation regarding the conceptualization of rigor. They argue rigor is a quantitative concept that is misfitted with qualitative social research and set out to re-conceptualize rigor for qualitative research. They began this journey by searching for rigor in how-to research methods book, and noted the term’s explicit absence from these texts’ indexes, but implicit presence in “discussions about objectivity, neutrality, reliability, replication, and validity” (p. 280). They also noted the dictionary definition of rigor described “a strict enforcement of rules”. This suggested a “systemized... approach to research methods” (p. 280). This affinity for rigor as an ordered system aligns with our observation of our community’s tendency to systematize approaches or complexities as conventions, and it may be tied to both our community’s engineering disciplinary influences (e.g., “objectivity, neutrality”...) and pursuit of legitimacy. Perhaps one unspoken strategy for the legitimacy of this is to identify our conventions and build our own canon.

Davies and Dodd (2002) concluded their theorization of rigor in the research context that “If rigor is understood only in terms of a structured, measurable, systemized, ordered, uniform, and neutral approach,

then other research methods that allow flexibility, contradictions, incompleteness, or values will always appear “sloppy,” epitomizing everything that is “nonrigor” and therefore lacking in credibility” (p. 280). Riley (2017) agrees, citing a list of synonyms for sloppy: “Laxness, lenience, sloppiness, inaccuracy, carelessness, incoherence, slovenliness...” (p. 250).

New Formulations of Quality

What should quality in fact look like in EER? We do not have a simple or easy answer, but we suggest as one possible metric the authentic and meaningful contribution as understood and assessed by the reader. If the reader is informed about and engaged in the collective project of improving EER, then they can assess the authenticity of the presentation of the literature, the theory, and the study as a contribution to that collective project. A meaningful contribution may or may not have all of the component parts that legitimate quality in the traditional gatekeeping system; however, if the purpose of the research moves the author and contributes to knowledge, then it may be deemed a meaningful, or even transformative, contribution.

In parallel, Davies and Dodd (2002) propose ethics as a way to reconceptualize rigor and quality in qualitative research. This is rooted in an “ethic of care” with attentiveness, responsibility, competence and responsiveness core tenets (Gilligan, 1982; Tronto, 1982). Davies and Dodd (2002) write about research ethics comprising “trustfulness, openness, honesty, respectfulness, carefulness, and constant attentiveness” iterated throughout the research process and embedded “in the way we ask questions, how we respond to answers, and the way we reflect on the material” (p. 281). This ethic of care is connected to the researcher's positionality and the context of the research in a meaningful and messy way.

At the kernel of the discussion of quality, there is still a need to discern “good” and “bad” research. Ways of defining quality for qualitative social science research, including “attentiveness, empathy, carefulness, sensitivity, respect, honesty, reflection, conscientiousness, engagement, awareness, openness, context...” (Davies & Dodd, 2022, p. #), can also help ascertain if research is authentic. These terms can provide us with genuine measures of quality for our research authorship and a north star for the community to value in reading and reviewing. Through co-constructing these or similar concepts as shared values, researchers, reviewers, and readers can apply a “framework of care” in their work to produce, review, and engage with research in our community.

Authenticity and Privilege

We have heard some tell us that an appeal to authenticity in research reflects a privileged stance. We agree. We think there is a privilege in being able to work from our hearts. This privilege can be experienced in different ways. We variously experience financial privilege (the freedom not to live paycheck to paycheck), demographic privilege (the freedom to not have to prove one's self worth as a representative of a marginalized or stereotyped group), or other privilege (fast writing ability means one can make time for both check boxes and writing from the heart, for example). But, it is a simple fact that not all researchers feel or are free to work from the heart.

Many of us come to this field to improve it, to make things better (Bezerra Rodrigues, et al., 2021). We are inspired to do so. We are encouraged into this field; some of us talk about coming into this field serendipitously (Allendoerfer et al. 2007) – with fortunate happenstance, which we also experienced.

These motivations have bits of magic in them. They have heart; they have authenticity. But then, if we get into the fray of academia and are lucky enough to hit the treadmill of tenure and promotion, we may begin running frantically toward the coveted end goal, doing all we can to get there, working and producing less authentic and more academically performative work. We do what we think we need to and, in some cases, are told or mentored to do to survive in the system.²

Our published work within the academic system is mired in our struggles for legitimacy – proving one’s worth in a field that is not understood or well respected in some contexts (Seniuk Cicek et al., 2025). In our fear and desperation, we reach for what we have been given – the ‘tools’ and ‘rules’ of the trade – the methodology, the *rigor*. And many of us know what Riley (2017) argued about the detriments of rigor. Yet, we latch onto these directives as if they are canons in our field – grabbing onto these perceived rescue ropes and hauling ourselves along these mandates. Systemizing them. And perhaps, in our fever to rescue ourselves – to survive – we become so preoccupied with following the rigor of our methods or applying touted evaluative processes that we miss thinking about what we are trying to do with our research and why. We miss thinking about our purpose and if that purpose has the heart that will make our research resound with wonder and emotion as our study unfolds. We miss *feeling* our research, which, in all the messiness of trying to tell our research stories, is where that authenticity lives.

Conclusion and Advice

We hope we have provoked some thought in our readers, problematized some of our discipline’s conventions and offered new approaches for some of our problems. We wish to open up dialogue, rather than offer a single right new concept or approach for the field to systematize and use for gatekeeping. Yet in the spirit of offering some guidance, particularly to early career researchers who may be receiving the opposite advice from other influences, we conclude with a few specific suggestions from our vantage points, acknowledging our privilege, for how you can create authentic work:

- *Find your own balance between authenticity and rule following.* We all accept some rules and forms when engaging in disciplinary work and writing. We just should not lose the core purpose of our work in the process. Find the formats and venues that work to clarify and draw out your argument and contribution not obscure it.
- *Reinvigorate the messy authenticity of research.* If you do not know where to start with finding the right balance of heart work and rule following, a first place to look is towards the messiness of the research process itself. It does not lend itself to simple rules and checklists. The truth of the matter is we are all in a process of finding partial truths and the next useful contribution, and the right way to share those with others.
- *Think of what your audience crucially needs to hear.* As another prompt for finding your authentic contribution, you can think about what your prototypical audience knows or understands (as represented by a literature review, etc.). What message or story do you wish to share with them, show them, convince them, persuade them, explain to them, critique, or say?
- *Trust yourself.* Each person has their own unique and wonderful approach to the world. Each researcher experiences something in the world that others need to hear. Trust that your authentic

² For inspiration and antidotes to the pressure to perform for tenure, read Nagpal (2013) and Cavanagh (2025), which are wonderful suggestions by one of our reviewers.

contribution will be heard and understood and accepted. If your audience misunderstands you, write it again.

- *Think of impact as changing minds and changing the world, not citations.* You may need to run on your particular treadmill if that is where you are at in life, but do not convince yourself citations or “rigorous” methods are the same as having an impact on engineering education. Work towards working in a way where the world is different as a result of your writing.

In parallel, for EER reviewers, editors, and community leaders, we suggest:

- Let us co-create new possibilities for quality metrics that get to the heart of what we want to value in EER, including contribution and authenticity.
- Consider the disciplining power of the review process and the systematizing forces within publishing. Wield these powers with care to support genuine engagement and reflection over performativity.
- Provide advice and role models for early career researchers to make meaningful contributions while passing a dissertation, gaining a journal publication credit, or receiving tenure.
- Provide thoughtful and nuanced evaluation at all stages of academic process, including valuing meaningful or transformative contributions above quantity and performance of quality.

Perhaps we are naïve. There are reasons for every system to function as it does, and perhaps the system of EER and academia is functioning as the community who create and sustain it would want. Perhaps we have different backgrounds, training, experiences, and our peers who uphold aspects of this system will disagree with us. But, we think the heart and essence of any scholarship is that magic moment when writing can move a reader. Inspire them. Inspire their research, their teaching, their thinking. Writing can change us and change the world. That heart, that authenticity, that contribution - that little moment of magic - should be why we do what we do.

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