

THEORY

Positionality Statements in Engineering Education Research: A Look at the Hand that Guides the Methodological Tools

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Background: Positionality captures how the researcher is positioned, personally, socially, and politically, in relation to the study's context. A researcher's positionality influences each step of the project, which makes it a critical component to make visible in publications.

Purpose: The purpose of this research article is to explore current considerations of positionality in engineering education research by highlighting example statements across journals and modes of inquiry. We considered qualitative, quantitative, and mixed methods approaches to engaging with questions of interest to the field.

Design/Method: We surveyed three journals in the field of engineering education: The *Journal of Engineering Education* (JEE), the *International Journal of Engineering Education* (IJEE), and the *European Journal of Engineering Education* (EJEE) in the timeframe of 2008–2020. We used search terms from the Engineering Education Research Taxonomy as a starting point for searching each journal and pulling abstracts to begin parsing relevant articles, including a direct search for positionality. The direct search results were narrowed down by appending personal pronouns to positionality-oriented language, such as "lens," "perspective," and "experience." We found 15 examples of positionality statements, which we categorized based upon their content in relation to their study's context and where the statement appeared in the manuscript.

Results: Explicit positionality statements were sparse across the reviewed journals. The few positionality statements we could locate exhibited three main approaches: disclosing identities, disclosing experience and opportunities, and disclosing journeys. We draw particular attention to the language used in the positionality statements to highlight differences in writing style and the relative space dedicated to discussing issues of positionality in the example publications.

Conclusions: A degree of vulnerability is needed for a researcher to construct positionality statements for their work, which is shared publicly with a research community. Reflection, accountability, and admission of lessons learned are not readily discussed across engineering education research. Accordingly, we offer suggestions and raise questions for the broader community to engage with their—often unstated or underemphasized—influences in the research process, especially with quantitative approaches.

Keywords: positionality; methodology; engineering education research

Introduction

One dimension of research in engineering education concerns how the researcher is positioned relative to the study and its participants. This crucial context is called *positionality*. Rowe (2014) defined positionality as the stance or positioning of the researcher in relation to the social and political context of the study (the community, the organization, or the participant group) and contended that "the position adopted by a researcher affects every phase of the research process, from the way the question or problem is initially constructed, designed, and conducted to how others are invited to participate, the ways in which knowledge is constructed and acted on and, finally, the ways in which outcomes are disseminated and published"

(p. 2). Accordingly, researcher positionality is an act of making the invisible decisions and interpretations of the researcher visible in the study. As Sandra Harding (1987) argued in “Feminism & Methodology,” the “class, race, culture and gender, assumptions, beliefs and behaviour of the researcher must be placed within the frame of the picture that [they] attempt to paint” (p. 9). Researcher positionality implies a need for critical reflection, which questions the notion of value-neutral evidence held up by the gold standard of research, Randomized Control Trials (RCT) (Biesta, 2010; Cartwright, 2007).

Each research project is made up of countless decisions (for example, defining the population of study, sampling, choice in research design, analysis, writing and editing text) that are purposefully selected by the researcher. Yet, as researchers, “our methodologies derive from our presumptions about our subjects and ourselves,” which can hide under value-neutral category-making (Slaton & Pawley, 2018, p. 139). Approaches that critique category-making through social relations examine:

ideas regarding what inputs shall count as evidence, and how they shall so count [and] are made far more complex than would appear to be the case from conventional educational research, in which researchers rarely identify subjects and or describe teaching and learning processes with any reference to their (the researchers’) own positionality (Slaton & Pawley, 2018, p. 140).

Because the positioning of the researcher is a critical ontological component of studying social phenomena, not considering how one’s position influences a research design can become a threat to the result’s credibility. The reflexive process of situating oneself in the research process occurs from the project’s conceptualization to the point the manuscript is in press—and for any interpretation of the results thereafter.

The purpose of this article is to examine how part of the researcher’s reflexivity manifests in published works describing engineering education research; we refer to the documentation of researchers situating themselves in the study as positionality statements. Notably, the full extent of a researcher’s reflexivity extends far beyond what is a documented positionality statement in a published article, which is why we maintain that we examine only part of this process. We highlight the use of positionality statements in published engineering education research articles spanning three journals commonly used as publication venues. In doing so, we examine how and what researchers disclose about their positionality within the boundaries of engineering education research journals.

We begin this article with a brief history of positionality to understand its origin within the dominant structures of knowledge production. Next, we discuss the development of knowledge production in engineering education. In discussing these historical and contextual influences, we offer context as to how and why positionality came to light in various fields of research.

Positionality in Historical Context

The role of the researcher has changed throughout the development of social science research methods. From the era of the Enlightenment to postmodernity, knowledge production has transformed as a reflection of its historical context. For instance, the increase in Cold War-era federal funding brought about an epistemological shift in the social sciences toward positivist efforts to quantify, measure, and predict human behavior (Cohen-Cole, 2014; Lapore, 2020). Post-structuralism and post-modernism were responses to the belief that establishing universal truths in the social sciences was possible, critiquing the structures in which researchers produced knowledge.

A lack of positionality was one critique posed by postmodernists. Without acknowledging one’s “positioning in relation to the social and political context of study” (Rowe, 2014, p. 2), postmodernists argued that researchers unwittingly imposed their positionalities on their subjects of study, potentially doing harm when those populations did not reflect the researcher’s background (Kincheloe & McLaren, 2011). To remedy this disconnect between the researcher and the study’s participants, feminist and critical theorists developed positionality as a way to acknowledge the influence of socially constructed identities such as race, class, and gender in knowledge production (Kincheloe & McLaren, 2011; Maher & Tetreault, 1998). Therefore, positionality has served to identify a relational position in society that is marked by aspects of the person’s identity, rather than as intrinsic qualities rooted in essentialist theory (Maher & Tetreault, 1993).

In 1988, Linda Alcoff developed her conceptualization of positionality. Alcoff drew on Teresa De Lauretis, who asserted a need to bring specificity to non-essentialist theories (e.g., no totality or rooted specificity) and give voice to vulnerable communities. For Alcoff, positionality was meant to highlight the researcher-subject relationship by explicitly addressing relational position and power. Her development of positionality involved self-analysis within historical dimensions (e.g., considerations of the past) to draw attention to the social or political context in which a person is situated. Thus, positionality has been understood as a product of a person’s external situation as well as a “product of [their] own interpretation and reconstruction of [their] history, as mediated through the cultural discursive context to which she has access” (Alcoff, 1988, p. 434).

Alcoff's work on positionality was a method aimed at explicating the context of power relations in creating knowledge. It is often assumed that the participant is the one in the researcher-participant relationship who is in the more vulnerable position. Note, however, that the power differential is not always one-sided; a researcher could be in a more vulnerable position based on a combination of factors like academic rank, political power, financial status, gender, and race.

Relational positioning has become ever more present in research and our daily lives because of our intensified exposure to difference (that is, racial, class, gender, political) especially in the United States. Accordingly, we acknowledge that we are writing this manuscript in a time of shifting public consciousness. The Black Lives Matter movement has once again renewed national discourse at an immense scale about systemic inhumanity against Black, Indigenous, and other People of Color. In response to social unrest spurred by the murders of George Floyd, Breonna Taylor, Tony McDade, among many others, individuals, organizations, and institutions (spanning business and education sectors) have stated their positions against systemic racism and injustice through this recent dialogue. As in our research, the movement has prompted us as a society to think about aspects such as our position in society, what we believe, and how to engage in transformative actions capable of altering the status quo—a process Paulo Freire called *praxis* (2000). These statements have produced symbolic gestures to dismantle physical artifacts of systemic racism (e.g., statues of confederate leaders). However, systemic change mechanisms have been sparse (Moore, 2020), and the current majority support for the Black Lives Matter movement has been declining in the months following the summer of 2020 (Thomas & Horowitz, 2020).

For many higher education institutions, the impact of this historic time ended with polished positionality statements published by university leaders. Other institutions have pushed their departments to rethink their structures and practices to promote inclusivity. We contend that these calls to rethink practice can extend to engineering education research, building upon initial commentary offered by authors like Godwin (2020) in this journal and exploration in the recent work by Secules et al. (2021) in the *Journal of Engineering Education*. Here, we discuss how engineering education research can be strengthened by a more thoughtful integration of positionality in the field's work.

Positionality in Engineering Education Research

In this paper, we argue that discussions of researcher positionality can bolster engineering education research by providing context in the production of knowledge while taking care to use non-exploitive methods of inquiry (Slaton & Pawley, 2018). In particular, outlining one's positioning relative to the study context can bolster research transparency and the community's trust in the work. The field of engineering education is situated at the intersection of multiple disciplines with differing epistemologies. As such, engineering education researchers have drawn from multiple methodologies as the research context demands. Without careful integration or intentionality, this methodological abundance can lead to the superficial usage of multiple methods (Martin, 2017).

In the engineering disciplines, there is a prevalence of objectivity that disregards the researcher's influence on the project. Considering the majority of engineering education researchers were trained as engineers, this positivist epistemology can be difficult to disrupt (Borrego, 2007). As such, an acknowledgment of positionality can help researchers to recognize and articulate the entrenched and "normative evaluative claims of others" that their participants experience (Kincheloe & McLaren, 2011, p. 310). This recommendation echoes recent contributions by engineering education researchers who have begun to include and advocate for positionality in their publications (Mejia, Revelo, Villanueva, & Mejia, 2018; Sochacka, Walther, & Pawley, 2018).

Kincheloe and McLaren (2011) suggested that researchers who examine their positionalities in relation to those they study will be better able to discern insights that represent their participants rather than unwittingly impose and reinforce hegemonic ideas that can be harmful to vulnerable populations. These insights are present at every stage of a research study, as described earlier by Rowe's (2014) definition of positionality. For instance, not understanding how one's positionality impacts interactions with the study's population erodes trust between the researcher and participants. This trust is especially critical for engineering education researchers working with underrepresented populations. However, positionality also factors into studies involving populations in the majority within engineering—even though there may be an assumption that examining one's positioning is not needed in this regard. The historical and engineering education contexts have provided a starting point to consider the nuances that would need to be recognized in our exploration to find positionality statements. Therefore, we conducted a review of three engineering education journals to examine how positionality is disclosed and discussed in our engineering education community.

Methods

We examined the use of positionality in three journals in the field of engineering education during the timeframe of 2008–2020. The journals we chose were common publishing venues for the engineering education community: The *Journal of Engineering Education* (JEE), the *European Journal of Engineering Education* (EJEE), and the *International Journal of Engineering Education* (IJEE).

The first critical component of our methods was locating articles containing positionality statements. Our research team held literature search meetings to discuss approaches to culling the statements from the publications. In addition, we consulted with the university librarian for engineering education as a way of peer debriefing our methods (Spall, 1998). To tease out positionality statements that were not in a dedicated section, we linked keywords that could signal a description of the researcher's experience with personal pronouns. Accordingly, we directly searched for "positionality" along with the following strategy: combine personal pronouns like "my" and "our" and possessive nouns like "researcher*" or "author*" for articles adopting a third-person writing style with the experience-centric words such as "paradigm" and "worldview" using the AND Boolean operator. The terms we attempted were: *positionality, worldview, partiality, epistemology, paradigm, critical inquiry, reflexivity*. These terms were OR'ed in a string together along with their AND'ed variations using personal pronouns. For example, "my AND worldview" OR "our AND worldview" OR "her AND worldview." Our keywords attempted to capture the essence of positionality through the researcher's beliefs directly and indirectly. False hits involving participant quotes were removed from consideration because they did not address researcher positionalities.

IJEE presented specific challenges, so the article selection process differed slightly from searches within JEE and EJEE. The IJEE webpages did not provide a comprehensive search with keyword strings and date range, so the authors reached out to editors at IJEE for guidance. With the date range not being available for IJEE, only keywords could be used for searches. An initial search for keywords such as "positionality" yielded over 2,000 items. For this reason, we formed a nested sample of articles from IJEE to attempt to find keywords that would increase the likelihood of finding positionality statements. These keywords included possessive and determiner pronouns (e.g., her, their, my, our) like our searches in JEE and EJEE. We also AND'ed the search with a "NOT position" to omit cases where the stem word "position" was being returned. The IJEE editors sent us a directory of abstracts within the date range requested that assisted in hand-searching individual volumes for the keywords presented above.

We met regularly to discuss and reflect on the examples we found by reading the hits in the search stage as a form of maintaining process reliability (Walther et al., 2017). Throughout our meetings, we continuously memoed and re-read the articles as a form of meaning-making with the data (Birks, Chapman, & Francis, 2008). Once we reached saturation aligned with our research objectives, as evident by repetition in our meeting notes (see Saunders et al., 2018), we categorized the examples. Categorization included labeling the location where the example positionality statement occurred in the manuscript, a description of the positionality statement, and degree of description observed in the positionality statements. We then synthesized the common elements of the examples dynamically in our meetings and individually to create the short descriptions presented here.

Results

Inferences Drawn from our Search: The Difficulty in Studying Positionality

The search process for positionality statements revealed several insights related to the structural components of the articles, that is, the location and format of the positionality statements within them. The search for positionality statements revealed the first structural insight. Our search began much like any review; we constructed a set of key terms such as "trustworthiness," "credibility," and "dependability" under the "Research Approaches" level of the Engineering Education Research Taxonomy (Finelli, Borrego, & Rasoulifar, 2015) to find a set of viable articles. Because of the generic use of the keywords in the taxonomy, we quickly realized we would need to read virtually every empirical article published in the three journals, requiring us to be more stringent in our search. Our shortened set of keywords presented similar issues.

We initially limited our list of search keywords from the Engineering Education Research Taxonomy (Finelli, Borrego, & Rasoulifar, 2015). Positionality-centric terms including "worldview" and "perspective," "story," and "lens" were added as we recognized their prevalent use in positionality statements—all of which, unfortunately, are also used regularly in a variety of research manuscript contexts, such as participant quotes. This set of keywords returned an extensive collection of papers with little relevance to our research aims as a result. Not many authors were using the language of positionality explicitly. We needed to meet to discuss the initial list of hits and think of an alternative way to tease out positionality. This alternate method was needed to find some alternate contrasting examples that did not use the terminology to cross-check our keywords or add additional keywords that we needed to add to our search.

Another difficulty emerged when screening articles. Although some journals like *Murmurations* have explicit point-of-view sections in their abstracts (Vanasupa, Cheville, & Channing, 2018), papers published in most other journals rarely discussed any aspect of positionality in the abstracts of the journals we reviewed. Therefore, sorting through articles without accessing the full text was a considerable effort, which was especially troublesome in locating IJEE manuscripts as examples due to the need to open each volume and search within it for the chosen search words discussed previously. Although abstracts existed for a particular article, there was no way to know from the abstract alone if a positionality statement was included in the body of the article. After realizing that another depth of analysis was needed, iterations of the search process included adding pronouns to keywords (e.g., "my positionality"). This step brought out more detailed positionality

statements and filtered out most articles using words such as “perspective,” “experience,” and “lens” in other contexts. Once these words were used as filters to sift our relevant articles, the number of articles to search directly decreased dramatically, leaving a few unrelated articles and those with some type of positionality statement. We found our final search strategy to help find unlabeled positionality statements but still did not eliminate issues with participant quotes.

Another challenging aspect of finding positionality statements was the rhetorical style authors employ, or are compelled to employ, in their manuscripts. A rhetoric that journals and textbooks encourage appears to exist, rules on language use that are acknowledged to be divisive (e.g., Harwood, 2006). In particular, quantitative research is often encouraged to be written without reference to personal pronouns, linguistically removing the hand guiding the tools (that is, the researcher) to present results with objectivity (Dobakhti & Hassan, 2017). For example, Creswell’s (2013) examples in his chapter on quantitative methods in his well-cited textbook (Google Scholar reports 149,735 citations as of 11/12/2020) do not use personal pronouns. Considering quantitative research is often associated with positivism, the few uses of personal pronouns can be interpreted as “attempts to avoid the personal responsibility that subjectivity entails” (Hyland, 2002, p. 1107).

The erasure of the researcher is not only socialized, but institutionalized through editorial policies. Some journals explicitly discourage the use of personal pronouns in their guides for authors. For example, the IEEE Transactions on Education guide for authors page instructs potential authors that “Manuscripts should be no longer than six journal pages, must be written in the third person (avoiding the use of I, we, our, etc.), and follow usage in the IEEE Style Manual (IEEE, 2020, p. 1). The first-person rhetoric made it more likely for elements of positionality to be identified by our search, specifically when the authors discussed themselves in that mode of language, that is, how the research team or author ensured quality. For example:

Additionally, we engaged in a self-reflexive exercise at the outset of data analysis to best leverage the diverse experiences and identities of the research team members. For example, one team member has two engineering degrees and is deeply involved in professional and educational engineering spaces. The other two research team members are not engineers but have worked with engineering students via academic advising and in sponsor roles for student organizations (Morgan, Davis, & López, 2020, p. 114).

The combination of rhetorical styles and broad use of words like lens or perspective made the process of pinpointing positionality in the literature a finding of its own.

Themes of the Reviewed Positionality Statements

The results of the search and analysis of explicit statements of positionality were conceptualized in two ways: (1) frequency count data of the number of hits we received when searching for positionality and (2) reviewing the content of the positionality statements we found. We began with the descriptive data on the prevalence of positionality search terms (given in **Table 1**). We found a small collection of explicit positionality statements, 16 in total. Because of our search strategy, *IJEE* seemed to be a special case, where the journal appeared to be bustling with discussion of positionality at first glance) 2,618 hits. As noted in our search approach, the count was a gross overestimate because of the search engine. Combining positionality with “NOT position” nulled the search to return zero results because the stem word “position” was responsible for the high hit count. When we searched *IJEE* more thoroughly by hand using the pronouns to filter out unrelated hits, 36 viable articles were found, 5 of which had positionality statements dating back to 2010. We drew the most explicit positionality statements from *JEE*, all seven of which were written in 2018 or after. *EJEE* had the least number of search results with potential positionality statements, all three of which were written in either 2019 or 2020. All 15 studies we identified with positionality statements were qualitative, excluding a research review we located in *JEE*.

Next, we will discuss the structural content of the manuscripts. For manuscripts describing the authors’ positionalities, we examined where the statements appeared in the manuscript. In **Table 2**, we present a summary of examples from each journal with respect to where the positionality statement occurred in the manuscript. Moreover, we highlight what *kind* of section the example occurred within the section. For example, Dringenberg and Purzer (2018) detailed their positionality in

Table 1: Search Term Hit Frequency.

Search Term	<i>JEE</i>	<i>EJEE</i>	<i>IJEE</i>
“Positionality” with search term/ strings including pronouns of “my,” “we,” “our,” “author”	24 hits, 7 with positionality statements (all qualitative except 1 research review)	6 hits, 3 with positionality statements (all three qualitative studies)	2,618 hits, 36 viable hits with pronouns, 5 statements (all qualitative studies)

Table 2: Location of positionality statement in selected examples from our search.

Paper Section	JEE	EJEE	IJEE
Introduction	Jordan et al. (2019) <i>in own positionality main section</i>		Lewis, M. (2010) <i>in "introduction"</i>
Background	Secules, Gupta, Elby, & Turpen (2018) <i>in a "paper contributions and versions" section</i>		Howe, S; Smyser, B., Hart, R., Stanfill, R.K. (2019) <i>embedded in editorial</i>
Methods	Secules, Gupta, Elby, & Tanu (2018) <i>included "participant and researcher positionalities"</i> Blosser (2019) <i>had explicit section before limitations</i> Dringenberg & Purzer (2018) <i>in "validity and reliability"</i> Pembridge & Paretto (2019) <i>embedded in "trustworthiness"</i>	Almeida, Becker, & Villanueva (2020) <i>in own shorter positionality statement</i> Boklage, Coley & Kellam (2019) <i>in own longer positionality statement</i> Daniel & Mazzurco (2019) <i>embedded within "data analysis"</i>	Bernhard, J., & Baillie, C. (2016) <i>embedded in "perspective awareness"</i> Gray, C. & Fernandez, T.M. (2018) <i>in own positionality section</i>
Appendices	Pawley (2019) <i>offset positionality to other publication(s)</i>		Tenenberg, J. (2019) <i>in Appendix: Review Method</i>

the "Validity and Reliability" subsection of their methods, whereas Secules, Gupta, Elby, and Turpen (2018) explicitly labeled the section with "positionality." The examples we found tended to have full-fledged positionality statements somewhere in their methods section compared to any of part of the manuscript, implicitly associating positionality with the research quality and design processes.

Examples of Positionality Statements

Our analysis of the positionality statements revealed several variations that authors used to describe their connection to research. The variations of these statements were all related to some form of disclosure. We used the term *disclosure* to describe revealing information that connects the researcher to the research. The disclosures that follow were related to identities, experiences, opportunities, and journeys. These examples represented a sample of positionality statements across the JEE, EJEE, and IJEE.

Disclosing Identities

Transparency in a positionality statement entailed discussing how the researchers' identity influenced research components such as data collection, analytical choices, and interpretations. The identity most often disclosed was racial. For example, Blosser (2019) in JEE explored how educational environments in engineering marginalize Black women with a secondary question concerning how practices could be shifted to make Black women's experience more positive. She positioned the need for a positionality statement as a methodological necessity because of her use of a constructivist grounded theory approach, as the researchers' perspectives could impact the process of inquiry (see Charmaz, 2014). Blosser (2019) discussed how her race impacted data collection:

My status as a White woman sometimes made it difficult to discuss racial issues with participants, who may have been unsure about how freely they should talk about their experiences. I believe some of them would have shared more details and been more comfortable discussing these issues with a researcher who shared their racial background (p. 59).

She used the space in her positionality statement to explain how she connected with participants for more open discussions about race in engineering education:

I explained to all participants as the study progressed that I wanted to use the information they shared in an effort to draw awareness to their experiences and advocate for change (p. 59).

Next, Blair, Miller, Ong, and Zastavker (2017) in the JEE studied how STEM faculty responsible for teaching first-year engineering classes formulated their teacher identities and responsibilities in relation to gender equity. The authors listed their relevant identities and academic experience, providing context to establish their backgrounds as appropriate for the study:

We identify as middle-class women from a variety of ethnic backgrounds (Asian American, Jewish, White, first-generation immigrant). Three of us have graduate training as educational researchers, one as a physicist, and we all share research interests and perform scholarly work in STEM education and gender. Two of us are mid-career researchers and scholars and two of us are in our early careers. We all have experience teaching undergraduates, and two of us have taught in undergraduate engineering programs (p. 22).

Authors displayed varying levels of disclosure. In our two examples, Blosser (2019) embedded positionality by connecting the statement to her overarching methodology, whereas Blair et al. (2017) demonstrated transparency albeit without making an explicit connection to the design procedures. Connection of positionality with research procedures can be achieved in a thoughtful manner, which often includes tying in identities. Because Blosser (2019) was working with differing racial experiences, a positionality statement could seem more crucial than in a study where all of the participants belong to the same group, however defined. Thinking more critically about the researcher's positioning relative to the study's participants could illuminate design considerations that go beyond more obvious notions of difference.

Before we proceed, we must emphasize that we are in no way advocating researchers to disclose all of their identities in all situations, especially if doing so is potentially harmful to one's self personally or professionally. For example, disclosing that one is a member of the LGBTQ+ community or identifies as a person with a disability might be deemed too high of a risk. These are highly personal, invisible identities that could be relevant to the research process. However, stating these identities in a positionality statement could come at substantial personal cost. Therefore, we leave it to researchers to frame their motivations with respect to identities as relevant without placing themselves in compromising positions.

Disclosing Prior Experiences and Opportunities

Positionality statements were not only a listing of the researcher's intersecting identities. Some positionality statements made reference to the researcher's previous work experience or education, and could often be connected with opportunities, like unique access to a particular population, the researchers sought or identified within the context of the research, which was why we combined these themes. For example, in EJEE, Boklage, Coley, and Kellam (2019) studied engineering educator's transformations of pedagogy. Each of these authors discussed their positionalities as they related to their professional standing and an explanation of their interest in the topic.

The first author of this paper, Audrey Boklage, approached this research from the perspective of a STEM educator. She spent seven years teaching high school science and had experienced her own road of trials towards creating a student-centered classroom (p. 928).

Similarly,

the third author, Nadia Kellam, has a background in mechanical engineering and has been a faculty member who conducts engineering education research for over 10 years. She believes in the power of stories and, in this work, is interested in learning from the success stories of faculty who have transitioned their teaching practices (p. 929).

On the other hand, the second author discussed how conducting the research gave her the *opportunity* to develop professionally:

During the data collection phase of this study, Brooke [Coley] was in a postdoctoral position applying to faculty positions in engineering. Interviewing these participants served as a form of mentorship, guidance and encouragement regarding how to embrace student-centered teaching strategies (p. 928).

Coley acknowledged how conducting research influenced their professional growth through mentorship and even community-building between the researcher and participants:

Through these stories, she believed others would also value and learn from these faculty and similarly be inspired for change, even knowing the process would be challenging. The participants in this study made it seem worth the investment of self and resources (p. 928).

The third author shared similar notes of admiration as she discussed using the participant stories as an opportunity to effect change.

She understands that the lived experiences of faculty are complex and nuanced and is interested in bringing stories of these faculty to light to, hopefully, help empower other faculty to make changes in their teaching (p. 929).

Each of the author's positionalities included how their backgrounds and interests informed the research design. The first two authors only noted how their backgrounds were helpful for conducting and interpreting interviews, whereas the third author explained that her background "influenced the research design, including the interview protocol, the theoretical framework, the choice to use narrative research methods in this study, and the approach to understanding faculty change through studying successful stories of change" (Boklage, Coley, and Kellam, 2019, p. 929). For the first author, "because of her background, she found that she related well to the participants during the interviews" (2019, p. 929). The second author explained how her "interest in these faculty stories influenced her follow-up and probing questions during the interviews, [which] likely influenced the stories that she constructed based on these interviews, and influenced her interpretations of these narratives" (2019, p. 929).

In these three positionalities, the authors discussed their professional backgrounds as they related to their interests in the research subjects to inform their research design. In the case of the postdoctoral researcher, Brooke, she included a discussion of opportunities afforded to her—that is, mentorship and guidance from the study's participants. As an added step, the authors included advocacy for innovative pedagogical practices in their intentions of the research. These statements highlighted how authors could connect personal experiences and leverage them into opportunities as relevant to the research design.

Disclosing Journeys

Several researchers described how they arrived at the research within the article, almost akin to a chronological description of their involvement with the research over time—distinguishing it from our previous theme. Either singularly, or in collaboration with other researchers, these authors went into detail on the influences that led them to do the described work. An example of how the author's journey in research influenced their current work was evident in the work of Tenenberg (2019) in *IJEE*. This article included an additional section in the Appendix where the author described the path taken towards aligning personal interests with the interests of the research. What follows read as an autoethnographic sketch of their journey:

In early 2006, through serendipity, I encountered the research of Elinor Ostrom, a political scientist at Indiana University who studied cooperation in a variety of social dilemma situations, particularly those involving small to medium-sized groups of individuals collectively governing shared natural resource systems such as forests, fisheries, and freshwater... At the time, I had been using project teams in software engineering courses that I had taught for several years. I saw little from the literature on cooperative learning developed from the study of groupwork among primary and secondary school children that I felt was applicable to the project teams that I faced at the tertiary level... (p. 1722).

Here, Tenenberg (2019) described the motivation for the research and linked this research to a gap within literature. The positionality statement provides the experiential language to link his personal experience with research in the field.

Similarly, guest editorials by researchers in *IJEE* focused on a specific call or topic and provided an opportunity for researchers to discuss how their experiences related to the larger topic of research. Here Lewis (2010) used terminology such as *lens* to describe a personal view of a broader concept:

This paper is in some ways the story of the professional journey that I've been on for the past thirty-plus years towards a practice in sustainable design, which has led me to places and projects that I would never have imagined. It is also an anecdotal history of the evolution of the 'sustainability' concept in recent Western society, as seen through the lens of this engineer's professional practice (p. 247).

This type of editorial appeared to provide the authors with the space to relate what their experiences and journeys meant to the topic of design and sustainability. Although these forms of positioning were not directed towards a specific procedure or method, this form of writing a positionality state enabled the author to position their overall experience within the wider context of their research area and expertise.

A Cross-Cutting Positionality Statement Across Our Themes

After finding themes of what was included in our sample of positionality statements, we identified an example of a positionality statement that cut across several of our themes. This particular statement addressed the relationship between the author and the research that provided a well-described foundation for the authors' work.

This positionality statement was found in JEE in a manuscript by Jordan et al. (2019). This statement highlighted how the researchers integrated themselves into inquiry while managing quality considerations. In their study, the authors sought to understand the experiences Navajo engineers had with practically applying engineering design in the Navajo community. Jordan et al. (2019) took a direct approach to integrating their positionalities into the manuscript by not only placing the statement near the beginning of the text, but making the statement a main-headed section. This detail may seem small; however, we contended this stylistic choice communicates a priority on helping the reader understand how the researchers were motivated to conduct the study, how they worked with (and not for) the community, and how methodological choices were made to ensure research quality. Although positionality statements were most often placed in the methods section, Jordan et al. (2019) chose to present their transparency at the earliest opportunity. They began their statement by grounding its necessity in the literature:

The researchers conducting this study were guided by calls for researchers and educators to be transparent in their positionalities, personal histories, and perspectives in order to conduct reflexive and collaborative culturally responsive research with Native communities that will benefit them (Canada & Royal Commission on Aboriginal Peoples, 1996; Castagno & Brayboy, 2008; Haynes Writer, 2008; Kovach, 2005; University of Victoria Faculty of Human and Social Development, 2003). Within culturally responsive research, Indigenous and non-Indigenous scholars alike have the responsibility to uphold the integrity of culturally responsive work and acknowledge the cultural differences that influence and inform research (Kovach, 2005). This is particularly relevant to the engineering education research community, as the field of engineering is largely comprised of non-Indigenous peoples (National Action Council on Minorities in Engineering, 2012) (p. 357).

After disclosing the backgrounds of each author, it was noted that two of the five researchers were not members of the Indigenous community (*a disclosing identities* approach) by describing the authors' connections to the Navajo Nation:

Dr. Shawn S. Jordan and Dr. Chrissy H. Foster are Caucasian and of European descent, born in Indiana and Maryland, respectively. Ieshya K. Anderson is Tohono O'odham, born for the T'ááshchí'í (Red Bottom Clan) of the Diné (Navajo). Her mother's father is Naakét'áí (Flat Foot People), and her father's father is Tódich'í'ni (Bitter Water Clan). Anderson grew up on a small family farm in the Navajo Nation in the Four Corners area of New Mexico. Courtney Betoney is of the following clans: Kinyaa'àanii (Towering House Clan), Tódich'í'ni (Bitter Water Clan), Tàchii'ni (Red Running into the Water Clan), and T'ízi lání (Many Goats Clan). Betoney grew up in the Navajo Nation in Ganado, Arizona. Tyrine Pangan is a first generation Filipino immigrant born in Manila, Philippines, who immigrated with her family to the United States. The non-Indigenous research members have taken on the roles and responsibilities of serving as allies to Indigenous peoples and their communities (p. 357).

Next, they described how they came to be involved in this work, an example of the *disclosing journeys* style of positionality. At this stage, the authors highlighted their roles as allies to the community in the study—working in partnership:

The non-Indigenous research members have taken on the roles and responsibilities of serving as allies to Indigenous peoples and their communities. Together, the research team seeks to serve the Navajo people and their goals in partnership (p. 357).

Moreover, the authors noted they worked *with* instead of *for* the Navajo Nation in their statement by drawing upon the culturally responsible research body of literature:

This research is grounded in Indigenous perspectives, specifically Navajo perspectives, and the researchers are mindful of their role and influence in the research process (p. 357).

A positionality statement can highlight the connection between the author's intentions and the research purpose that is often obfuscated by writing practices aiming for objectivity. We also found an instance of the positionality statement *disclosing opportunities*. In this case, the opportunity was for the researcher to benefit their home community. This was highlighted in the subsequent paragraph in Jordan et al.'s (2019) statement; for example,

Betoney was driven to conduct the research because she saw many engineering parallels with the needs of her Navajo community, and she sought to guide and innovate how young Navajo people view this opportunity, no matter the difficulties they face in their lives (p. 357).

The authors' consideration of positionality within the design was connected in a "Validity and Reliability" section as well. Literature was used to protect the design from methodological critiques by drawing on Bang and Medin's (2010) work to explain how the outsiders to the community navigated cultural differences and adjusted design choices to reflect those differences:

While two of the authors are outsiders to the Navajo community, this study was conducted with the utmost respect for the Navajo people and culture, with the intent to encourage students to pursue higher education and careers in STEM fields. Bang and Medin's (2010) work detailing methodological and ethical considerations for working with Native American communities was used to inform the design of this study (e.g., elder input and community participation in the research agenda) (p. 363).

The positionality statement in Jordan et al. (2019) presented a point for the reader to interpret the intention behind the research as well as the authenticity of integrating this positionality throughout the article. The positionality statement by Jordan et al. (2019) represented a written form of what the researchers were exercising in practice.

Connecting Back to Our Positionalities

As we close our findings, it would be sensible to connect this work back to what our positionalities are relative to this research. Our research on positionality was conceived from a mutual frustration with a lack of acknowledgment in power dynamics between researchers and research participants. In these discussions, we noted researcher positionality as a method of acknowledging these power differences but we were surprised at the variability of the practice in engineering education publications. Cynthia and David had originally explored their positionalities as qualitative and quantitative researchers, respectively (Hampton & Reeping, 2019)—but had different ways of coming to understand how positionality was woven into engineering education research. Here, we will review our positionalities as relevant to this work in a *disclosing journeys* format—highlighting where our motivations converged.

Early in her EER journey, Cynthia observed that researchers rarely discussed their personal motivations for their study of marginalized communities, with results not considering the voices of those who were studied. Her perspective was primarily as a qualitative researcher.

Cynthia

My humanity is not represented fully through the majority of engineering education's viewpoints and teachings. I have continuously questioned how my lived experiences would influence the research I hoped to conduct within a system not historically attuned to my interests or existence. In early graduate courses, my interests lived on the edges of conversations about equity and marginalized groups. Often misunderstood, these interests did not align with the "normalized" standard of Euro-centric frames of research in engineering education and academia. I do not hold an untethered lived experience that exists without the integration of self and research. I have experienced a set of privileges others have not due to my "light-skinned" appearance that is upheld in our colorist society (Reece, 2021). Decoupling my Blackness, upbringing, and womanhood from my research is not an option that I am privy to when navigating the current system of engineering education research. The claim of objectivity does not exist, mainly when associated with narrative methods, race, and agency. When examining complexity, positionality can either constrain or enable the identification of inequity baked within a system. As a result, reading between the lines of a researcher's stated methodology and researcher motivation has become a routine exercise in my research critiques.

On the other hand, David had never thought deeply about how identity could have a tangible impact on the researcher until he expanded into new research topics. His perspective was primarily as a quantitative researcher, but also was approaching positionality in mixed methods research as well.

David

Like Cynthia, I had difficulty reconciling my lived experiences with my research interests. I had a subtle but nagging feeling of discomfort in terms of how my lived experience was incongruent with my study's population, such as my interest in studying how institutions communicate information for transfer students and their experiences in college despite the fact I had never been a transfer student myself or a member of a marginalized group. Moreover, the concept of studying a group of people conjured images of sterile latex gloves to me—as though research is some kind of clinical observation. This insincerity I felt in my research interests when juxtaposed with my background was a piece of positionality that crystallized when I attended a talk by Garvey (2018) at the Association for the Study of Higher Education. Garvey openly discussed difficult design decisions he had to make when studying participants who identified as queer and trans collegians, detailing the effect these choices had on his emotions as the researcher. These kinds of admissions or substantive description of the researcher's roles in quantitative research (hands that guide the methodological tools) seemed to almost always be absent

in publications. I have tried to incorporate positionality into my work in quantitative articles wherever possible by including explicit statements when publishing manuscripts.

Desen's contribution to the formation of the research in this paper was her push to contextualize this and previous research within their economic, social, and political dimensions.

Desen

My positionality is informed by both privileges and marginalization that grant me insight into the impacts of the dominant narratives institutionalized in systems of power. I am influenced by both my present and my past. I am a queer, Turkish-American woman in engineering education. My positionality is not only shaped by the present, but it is also shaped by certain privileges (such as Whiteness, able-bodiedness, and perceived heteronormativity) that I was afforded. As Chen, Mejia, and Breslin describe, researchers often unwittingly reproduce norms and inequities under science's hegemony without careful and ongoing reflection on one's own social, political, and economic positions (2019). My Whiteness, ability, and perceived heteronormativity led me to inherit meritocratic and technocratic narratives. I adopted these dominant narratives allotted by my privilege as "Truth". However, as I embraced my own positions, and learned more from other people, I learned and am still learning to recognize how various cultural, political, social, and economic factors create marginalization. Taking cues from other scholars' work, I continue to broaden my understanding of my economic, social, and political position as well as that of my research. My reflection into my position in society is ongoing as I engage in education research of faculty and students with whom I share similarities and differences.

Together through this work, we had come across a variety of ways in which authors incorporated their positionalities into their publications. In analyzing them and preparing recommendations for the research community, we found that the vulnerability of positionality statements cannot be overemphasized. Revealing certain identities could become a professional liability for some authors, even though these identities may be crucial to the research. At the same time, positionality statements should not become a checkbox on the list of necessary items for publications. Even in writing our own statements, the writing and rewriting to fit stylistic conventions and choosing what to disclose for a journal publication was a challenge. In light of this work, we offer a discussion on the positionality statements we reviewed and draw some implications for the engineering education community.

Discussion and Conclusions

The small collection of positionality statements we found in the recent literature ranged in depth from a short paragraph to an entire page. Given this range we may ask, what is too much positionality? What is too little positionality? We have to balance disclosures with what is relevant to the research and avoid placing members of the community in compromising positions. Various engineering education researchers have shown a consistent effort to integrate positionality statements within studies in impactful ways that complement the methodology and epistemology of their studies (e.g., Beddoes, 2014). The expansion of positionality statements have been exclusively in the qualitative space based on our sample. The recent emergence of these statements can be seen as promising to support a more focused effort to position quantitative or more positivist perspectives in the context of how design decisions are made for those works (e.g., Garvey, 2018). The use of positionality can be used as a tool to disrupt the status quo of research, researcher, and those that are researched. In thinking about the aforementioned absences of positionality in quantitative research, there is a lack of scaffolding in engineering education research that does not properly address the systemic, power-based iterations of research that could continue to circulate within engineering education research. We contend the themes we developed offer a means to begin thinking about what those kinds of positionality statements could look like.

However, we also acknowledge and re-emphasize that incorporating positionality can be a privilege for some researchers, especially for those without invisible identities. Secules and Groen-McCall (2019) contend these hidden identities are coming into focus through scholarship in engineering education, and researchers need to examine their own identities critically with these in mind as they relate to the research project. Although disclosing identities that pertain to a particular research project can strengthen the methodology, disclosure through a positionality statement or *outing* can also have negative implications for the researcher in their workplace. Academic research is not without its own political and societal context that can make disclosure of less visible identities like LGBTQ status, political beliefs, or disability status difficult or simply damaging for the researcher's career (Abram, 2003; Cech & Rothwell, 2018). The political and societal constraints on researchers are especially critical, as similar researcher identities will not necessarily impact the research or the researcher in the same ways.

Rather than disclosing identities as a list, we encourage researchers to interrogate their identities within structures of power because the researcher-researched relationship is subject to power dynamics. Identities can be subject to multiple, intersecting systems of oppressive power that can have compounded effects of discrimination. An example of these intersecting systems was provided by Kimberlé Crenshaw in the case of Black women being discriminated against by General Motors on single axes of gender or race (Crenshaw, 1989). This kind of discrimination is covertly and overtly experienced

within the academy. Positionality theory has also been applied to leadership studies to account for the various conditions and factors (including identities) that shape leadership style (Kezar & Lester, 2010). In this way, identities are not considered separately or independently along lines of race and gender for instance, but rather as a way to observe how identity and power influence beliefs (Kezar & Lester, 2010).

Constraints to Including Positionality in Research

As we examine positionality statements, we acknowledge that research is produced within explicit constraints. Accordingly, the context of each of the researched journals is necessary to understand for interpreting our analyses. Each of the three engineering education journals we reviewed had a constraint on manuscript length. In EJEE, the maximum word count cannot exceed 8,000 words, JEE maintains that submissions should be between 8,000 to 10,000, while IJEE charges authors a fixed cost per page (see “Author Guidelines” in EJEE, JEE, and IJEE). The example from Jordan et al. (2019) spanned nearly a full journal page, which is not possible for all empirical studies to provide where space is limited. Many qualitative authors already find that they must reduce much of their detailed findings to adhere to word limit requirements. Thus, the positionality statement can lose importance as other sections vie for space. Because positionality statements are not normative practices in EER, they can be quick to disappear. Pawley’s (2019) strategy of pointing the reader to places where the reader can learn about her positionality is one strategy to mitigate pushing up against a journal’s word count.

This study did not yield any substantive examples of positionality or reflexivity in quantitative research. Fields such as critical data studies and science, technology and society have documented the inherent subjectivity in these positivist approaches to knowledge production and the harm that they can cause when generalized across populations they do not represent (Stage & Wells, 2014). There has been a small emergence of critical quantitative studies, such as quantitative research methodologies rooted in critical race theory that draw on researcher reflexivity (Garcia, Lopez, & Velez, 2018; Lopez, Binder, & Chavez, 2018; Solórzano & Ornelas 2002; Solórzano & Villalpando 1998; Solórzano & Yosso 2002). Yet, these types of methodologies remain undervalued and push against the normative practice of science.

Who Decides if Positionality Is Included in Research?

Although constraints in journal publications can impact the prioritization of content, journal editors and reviewers are well-positioned to shift the culture of EER such that positionality statements become a normative practice of the field. For example, the journal *Murmurations* explicitly provides a point-of-view section in the abstract that is equivalent to a mandatory positionality statement. Only two issues have been published since 2018 at the time of writing this manuscript, however. Also, in the most recent issue of the *Journal of Women and Minorities in Science and Engineering (JWMSE)*, Volume 26, Issue 3, the three articles in the issue included researcher positionality statements in the methods sections. These positionality statements ranged from disclosing expertise and experience, to racial and gender identification. Even from this small sample of three articles from JWMSE, the positionality statements ranged from similar to a biosketch usually found at the end of a paper, to more in-depth discussion on how the expertise and identity is linked to the research being conducted. All statements used some form of “lens through which...” (Corwin et al., 2020, p. 269; Dringenberg et al., 2020, p. 249; London et al., 2020, p. 224) to describe why the authors needed to share their stated researcher positionality. This stated researcher positionality, along with our findings, brings into question the language being used to present researcher positionality, the guidance by journals for requesting positionality, and what is deemed as common versus recommended practice within EER. Requests from journals such as JWMSE for researcher positionality to be embedded within submitted work is a promising step towards advancing the importance of positionality in EER.

As we have progressed through this manuscript, the terms reflexivity and positionality have been used to describe a tangible result in the form of a statement and as a process in conducting research. Creswell and Miller (2000) state that researcher reflexivity, or positionality, is a validity procedure to be used in qualitative research by researchers holding critical paradigm assumptions. Instead, we argue that positionality is necessary across all engineering education research, not just in a critical paradigm. Although we advocate for the increased use of positionality statements, we are careful to note that positionality is a way of engaging in research that extends its reach beyond the typical statement in the methods section. With positionality, we push researchers to reflect on their multiple identities, motivations, and personal experiences as they pertain to the subject under study. Not all identities (as well as prior experiences and motivations) must be shared or interrogated through positionality in each research project. Such practice would revert to forms of methodological accounting that we wish to avoid. Rather, positionality is the continued process of self-reflection of identities at each stage of the research to question how these identities influence the research.

Implications and Where We Go from Here

Positionality places a responsibility in the hands of the researcher, much beyond directives from institutional review boards to mitigate risks to participants and declaring conflicts of interest. It emphasizes that self-knowledge must operate with the production of new knowledge. Engineering education stands to have a potential impact in the knowledge, practice,

and spread of positionality statements. The draw of engineering education to many graduate students and researchers is the combination of various epistemologies that address some form of social or socio-technical inquiry. As we observed in statements that mention the race and gender of researchers, discussion on how the researchers' positionality was connected to the research, intention, or methods development is needed. The statement given by Jordan et al. (2019) is a particularly lengthy example, but also was in the tradition of community and action-based research. The spectrum of highly integrated positionality as seen in Jordan et al. (2019) and low integrated positionality was prevalent in our search for example statements.

In the context of U.S.-based EER, researchers cannot expect their audience to read between the lines for research studies that explore race, ethnicity, gender expression, persons with disabilities, and other visible and invisible identities. Specifically, regarding race, a researcher's stated experiences with race and identity impact a research study due to the longstanding history of misinformation, miseducation, and misrepresentation of Black American/Black/African American, Indigenous/Native American, Hispanic/Latinx, and other Persons of Color (Pacific-Islander, Asian-American, Multi-Racial) in the United States. For these reasons, an intentional analysis of how and where engineering education researchers are exploring positionality is necessary for providing context. Introductory graduate coursework in engineering education, activities in research groups, and intentional conversations of faculty and staff at the departmental level are necessary for being vigilant about the development, communication, and application of positionality in EER.

As a research community, we confront the challenge of meeting our audiences where they currently reside. We present motivations and background for our research. However, our current practices and beliefs of research can limit the extent to which societal and contextual factors from our own experiences come into play. An assumed level of researcher objectivity only further dilutes the potential impact of EER on our contextualized environments. Cynthia and David began to question where positionality exists in disseminating engineering education research (EER) in 2018 while graduate students in an engineering education doctoral program. A spirited conversation revealed a shared frustration for researchers who presented research without stating their assumptions and positions on race, equity, and methodology. The conversation would later develop with Desen into an interest to explore how researchers were positioning their work and the information that researchers included in their positioning. The space, bandwidth, and time for conversations like these are critical for the self-work and self-exploration that questions how we arrived at this point in our respective research and how we can be suited to use our research in this time of needed reckoning within our current system.

Competing Interests

The authors have no competing interests to declare.

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