WIP: In Search of Community: A Collaborative Inquiry Among Neurodivergent Engineering Education Researchers

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Introduction

This work-in-progress (WIP) research paper presents a collaborative inquiry elucidating neurodivergent experiences in engineering education. 'Neurodivergent' describes individuals whose brain functions and structures diverge from the societal norm; neurodivergent people are often considered to be disabled within current societal structures and systems [1]–[3]. Though 'neurodivergent' is intentionally *not* a diagnostic term, diagnoses (whether formal or self-) can still play an important role in neurodivergent individuals' paths to finding neurodivergent community [5], yet barriers to diagnosis (especially formal) are numerous (e.g. [31]). Undiagnosed neurodivergent people often experience social isolation without understanding why [4]. Even those with a diagnosis (or multiple) can still face isolation, as diagnoses are not roadmaps to the community, nor instructions on how to build one. With this in mind,, we initiated our collaboration to fulfill that need for a neurodivergent community between engineering education researchers by engaging in discourse that 1) exposes less visible concepts of in/accessibility, 2) challenges ableist structures and practices, and 3) cultivates neurodivergent engagement and inclusion. Our collaboration begins to uncover mechanisms that discriminate against neurodivergent people in engineering through the authors recounting their experiences within higher education contexts (completing a PhD or being employed as faculty in higher education). The authors also share strengths and strategies that helped them survive and, sometimes, thrive in these programs and positions.

Background

The term *neurodivergent* refers to divergence from neurotypical or typical brain functioning and structures, which includes people who are[1] autistic, schizophrenic, or who have anxiety disorders, ADHD, mood disorders, and more [8]–[11]. This term stems from the neurodiversity movement, an activist movement primarily in the US, as a descriptor that emancipates itself from the deficit-based language (e.g., learning disability, intellectual disability, cognitive disorder [12], [13]) of pathological models (e.g., "what's wrong with you?" and "how do we fix you?" [14]). As the term was created to challenge inappropriate pathologization and medicalization, being neurodivergent does not rely on formal diagnosis, which defers authority to medical professionals. Rather, neurodivergent is a broad term that includes individuals who may be considered self-diagnosed, formally diagnosed, or undiagnosed - or who may resist the notion of "diagnosis" altogether. Deficit-based conceptualizations often lead neurodivergent people to hide their neurodivergence to "appear normal" (masking) in an attempt to avoid stigma, discrimination, and violence [15]. In higher education, deficit-based language and framing still exist and perpetuate ableist pedagogy and treatment of neurodivergent students [16]. Some

[1]**Identity first language versus Person first language:** When discoursing about disability, researchers need to describe disability based on community or individual preferences. Identity first language puts the disability identity first (e.g., disabled person) while person first language, ostensibly, puts the person before (e.g., person with disability). We default to using identity first language when describing disability groups (e.g., autistic community) as a form of emancipation from deficit framing. Individuals' personal preferences may vary from the group preference (e.g., the first author's graduate student prefers person first language when describing her disability). There is a wealth of writing from autistic activists and scholars on the subject; for a small sample, see [6], [7].

initiatives have attempted to improve the accessibility of education to neurodivergent students. However, these initiatives often serve as a barrier more than as support [2], [15], [17], especially for neurodivergent people with intersecting oppressed identities (e.g., racial and ethnic minorities [16], queer [18]).

In engineering education, engineering's meritocratic and elitist culture further discourages neurodivergent students from seeking accommodations [19], [20]. Cuellar and colleagues [2] draw attention to additional obstacles to neurodivergent students' access in engineering education, including inaccessible pedagogy and difficulties obtaining the formal diagnoses necessary to qualify for accommodations. Despite a spike in interest in the past few years, neurodiversity in engineering education remains significantly underexplored. In their review of neurodiversity-related terms used in engineering education research (EER), Sorg [3] found pathologization of neurodivergence rampant, indicating EER is not exempt from the broader trend of deficit-based framing in higher education. Further, Sorg found widespread misuse of basic terminology, indicating existing neurodiversity research in engineering education may fail to meaningfully engage with scholarship in neurodiversity studies, a field largely led by neurodivergent scholars. Still, more and more researchers in engineering education are recognizing the harms of deficit-based approaches to neurodivergence, challenging normative assumptions and calling for paradigmatic change from the discipline [2], [3], [21]–[23].

Formation of a Neurodivergent Collaboration in Engineering Education

This collaboration formed organically as individuals began self-identifying as neurodivergent and discussing the need for community and neurodivergent research in engineering education. Each person in this collaboration had a recent neurodivergent diagnosis (self or formal) and began self-identifying themself to others at ASEE conferences or through networking. Specifically, the ASEE 2022 conference was an important event that brought us together. For example, the first author (Tsugawa) learned that the sixth author (Pawley) had a recent diagnosis during the ASEE 2022 conference. Since Tsugawa previously networked with Pawley from [their] DEI research, they felt comfortable approaching herabout neurodiversity research in engineering. Separately, the first and third authors (Tsugawa and Rodríguez-Simmonds)started discussing neurodivergence and writing about their experiences with one another at ASEE. These conversations led to identifying other neurodivergent researchers who also expressed interest in neurodiversity research in engineering, such as the second author (Sorg) being mentored by the sixth (Pawley). After the ASEE 2022 conference, our collaboration was initiated online, where we discussed our neurodivergent experiences in engineering. Our collaboration has led us to explore the question: **How does the EER infrastructure/community support and not support neurodivergent students, staff, and faculty?**

Method: Collaborative Inquiry

In this WIP paper, we used a collaborative inquiry approach, an action-oriented approach where a team of collaborators work together to develop a deeper understanding [24]. Many engineering education researchers have utilized the collaborative inquiry methodology to explore research practices that do not have strong consensus within EER, such as reflection [25], positionality [26], qualitative research quality [27], and more [28], [29]. Following this methodology, our virtual group met regularly and we reflected individually on prompts related to our inquiry in

between meetings. Our reflections and discussion meetings fostered group meaning and sense-making of our experiences as neurodivergent engineering education researchers. Collaborative inquiry also allowed us to recognize our agency, strengths, and challenges as neurodivergent engineering education researchers.

Data Collection

For this project, we met semi-regularly since ASEE 2022 and initially discussed different theoretical conceptions of neurodivergence, neurodiversity, and disability; in later meetings, our discussions focused on our lived experiences. We reflected on mutually agreed-upon prompts between meetings, one prompt at a time. We each documented our reflections in separate documents in a Shared Google Drive folder. We used the following reflection prompts.

Prompt 1 - Accessibility or inaccessibility in ENE:
Describe a time when you encountered accessibility or inaccessibility in engineering education (where you are currently) related to your neurodivergence. What happened? If you felt supported and were given accessibility, how did you experience that accessibility? If you survived or succeeded in overcoming that inaccessibility, how did you experience that inaccessibility?

Prompt 2 - What awesomeness feels like:
For this reflection, think about what awesomeness feels like with whatever your particular neurodivergence is. How does it feel when everything is clicking? When things come together, how does it feel?
What is a time when you feel like you are on the upside? What makes me feel proud of myself? What makes me feel joy?

Prompt 3 - Medications and Other Coping Mechanisms:
In this reflection, we invite you to share your thoughts and feelings about how medications and other coping mechanisms have helped or hindered your learning and teaching in engineering (this prompt was generated using BingGPT, which included several sub-questions not included here).

Our reflections were typically around 1-3 pages in length. Between meetings, we reviewed each others' reflections via a shared Google Drive and added comments to communicate aspects of resonance or contrast. In subsequent meetings, we elaborated and discussed our notes based on others' reflections. We drew on these reflections and discussions to develop a panel session for the 2023 ASEE Annual Conference & Exposition, which is described in more detail in the Preliminary Results section. Our stories shared during this panel and reflections after the conference serve as additional data for analysis.

Analysis

We are now at the analytical stage of identifying key shared and contrasting experiences and understanding the implications of those experiences for engineering education research and practice. We use thematic analysis to determine themes across and within the reflections, responses, discussions, and conference panels [30].

Preliminary Results

Thus far, an emergent theme suggests that many of us initially gathered (and continued to gather) because we felt alone and isolated; it was surprising and heartening to discover that we were not alone and that cultivating community with other neurodivergent people was possible in engineering education. Vocal participants reinforced a similar theme in an overflowing panel session at ASEE 2023. Our initial plan for the session was to split it into panelist stories (60 minutes) and synthesis (30 minutes), with an optional 'futures thinking' activity at the end if time allowed. We intended to split the time into seven chunks for the panelists' stories section, one for each panelist. For each chunk, panelists would have a few minutes to share a personal story of (in)accessibility in engineering education, largely drawn from our responses to discussion prompts, with the remainder of the time spent in discussion with other panelists and audience members.

However, once the session began, our plans quickly shifted in response to audience participation. Far from the silence session organizers feared, our audience quickly and enthusiastically engaged, many eager to share their stories. The second and fifth authors of this paper (Sorg and Kellam, respectively) captured the energy behind the discussion in their reflections on the panel:

> "It seemed like a lot of people had things that they wanted to share… There definitely was some 'magic' that appeared in the panel." - Fifth author

> "The big thing I remember, though, is how much folks from the audience wanted to share their stories or insight or what-have-you. It felt like folks were desperate to be seen, to be heard. It felt like the panel provided a space to validate a core part of ourselves... It felt really exciting, warm, joyful." - Second author

In response, we chose to eschew the original plan for synthesis and instead dedicated the entire session time to stories and discussion. In the ensuing discussion were stories of late diagnoses - of the joys and struggles of self-discovery, of time lost unknowingly trying to fit yourself into systems not built for you. There were stories of loneliness and feeling like "the only one" in your department, college, and/or program. Even with the additional 30 minutes (plus a few more minutes snagged from the succeeding break), the time still felt too short. After the session (both immediately after and throughout the remainder of the conference), several audience members approached panelists to express how much they appreciated the session and having a space to hear from other neurodivergent people. While these preliminary results primarily emerged from our ASEE panel session, these themes are reflected in many of our virtual conversations and in our individual reflections. These results suggest that there is an excitement and need for this work on neurodivergence in our engineering education community.

Implications and Conclusion

This paper has presented the background, methods, and some preliminary results of a longer archival paper in preparation. This paper will interest the broader research community because it increases the visibility of neurodivergent folks and draws attention to the need for more neurodivergent community spaces in engineering education while communicating a way to

unpack and examine the experiences of a potentially prevalent community in engineering. It also documents the construction of a community amongst those minoritized in engineering spaces by the community itself. This paper also contributes to a growing body of collaborative inquiry-based research to help practitioners navigate their careers, help practitioners better understand their students and colleagues, and help administrators/mentors develop an asset-based and systemic-based understanding of neurodivergence.

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