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Beyond deficits: Developing an elicitation mechanism for engineering practitioners with ADHD to create autoethnographic counterstories

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Introduction

In the last two decades, engineering education researchers have increasingly explored the traits of engineering students with ADHD (either formally or informally diagnosed), moving from deficit-based framings of students with ADHD to asset-based framings of the valuable characteristics individuals with ADHD bring to the engineering enterprise. However, while some investigations analyze the experiences of ADHD-having engineering students, few investigations center the narratives of ADHD-having engineering practitioners (faculty and students) to unravel how dominant discourses of disability and ADHD affect their engineering pathways. Further rendering those discourses invisible, disability is stigmatized, and open discussions of neurodivergence and disability are less prevalent, leading to an inability to understand how individuals with ADHD navigate engineering ecosystems. We have two main objectives in this paper: 1) critically analyze framings of ADHD and disability in engineering, and 2) create and disseminate qualitative elicitation questions to create counterstories from individuals with ADHD. This work forms part of a larger project to answer the following research question: **Can we reconceptualize ADHD in engineering beyond deficit frameworks through critical methods that uncover and question hegemonic discourses and the power those discourses have?**

Positionality Statement and Introduction to Co-authors

Our author team consists of two engineering graduate students at a research-intensive university, one engineering undergraduate student at a four-year college, and a visiting assistant engineering professor at a four-year college. We are in the process of filing an IRB to account for the various power dynamics on this team. We come from different backgrounds and have identities that range across race and ethnicity, LGBTQIA+, disability, and neurodivergence. We are all multiply marginalized in engineering. We feel like outsiders or insiders across different axes of identity in engineering spaces. This work is written from the vantage point of individuals with ADHD. In practice, this means we understand what it's like to constantly engage with systems, processes, classrooms, and ways of operating that do not feel natural to our ways of working. For example, we share the experience of sitting down to work on one task and finding ourselves working on several other tasks minutes later, with the seeming inability to control ourselves given our brain setup. This occurs several times a day. These fundamentally impact our experiences in a discipline that rewards grit and rigor.

Literature Review

Nick Walker's [1] work on terminology around different brain setups contains several useful terms for our study. First, neurotypical refers to people with a normative brain orientation. In contrast, neurodivergent refers to people with brain structures and functions outside the dominant societal norms. "Neurodivergent" refers to any and all individuals who do not fit in the neurotypical umbrella. Groups of people can be neurodiverse, which refers to "the diversity of human minds, the infinite variation in neurocognitive functioning within our species" [1, p.34]. Attention-Deficit/Hyperactivity Disorder (ADHD) is a type of neurodivergence characterized by a different relationship with executive function, leading to behaviors like increased risk-taking and divergent thinking [2]. Formalized diagnoses, like ADHD or autism, operate within a large spectrum and present themselves differently from person to person.

ADHD falls into the disability category in U.S. national reporting, even though not all people with ADHD identify as disabled [3]. Few national reports or data repositories provide much information on disability [4]. To complicate matters, many studies address learning disabilities but do not specify what they consider to be learning disabilities. Most healthcare professionals acknowledge that ADHD affects learning, but they generally do not consider it to be a learning disability [5]–[7].

Additionally, diagnosis can also be difficult to access, and can be impacted by one's race and gender identities. For example, in the US, people of color are up to 69% less likely to be diagnosed with ADHD than white people, and up to 75% of women with ADHD are undiagnosed [8], [9]. These factors make it difficult to know how many engineers have ADHD. It is hard to count how many ADHDers there are when many cannot access diagnosis at all. Furthermore, a diagnosis is needed to get accommodations. And even with accommodations, challenges persist for engineering students. Engineering faculty are considerably less likely to grant accommodations in their classes than faculty in other fields [10], contributing to the chilly climate for ADHDers. Next, we'll discuss two of the most common frameworks for examining non-majority individuals.

Predominantly, ADHDers are represented as having deficits when compared to the normative population. Much of the literature around ADHD, whether from the Diagnostic and Statistical Manual of Mental Disorders [11] or from researchers exploring how disabled students can improve their self-advocacy [12]–[14], focuses on a perceived deficit in ADHDers as the root cause of their challenges in school and work. But this framing can be demoralizing and places the burden of navigating a world [15] built for neurotypical people on the shoulders of those diagnosed with a "deficiency." McCall et al. [16] use qualitative methods to show specific examples of the inhospitable nature of engineering environments for ADHDers. They interviewed a Civil Engineering student with ADHD who felt that her ADHD misaligned with engineering spaces because engineers are problem-solvers and ADHD is "'a problem [she] can't

solve'" [16, p. 83]. This culture of deficit framing is seen across STEM disciplines [17]. Some researchers counter this deficit framing of those with ADHD by looking at their assets.

Asset-based framing is in response to deficit-based framing and highlights the skills and traits that ADHDers have that are advantageous. A common asset attributed to ADHDers is creativity. The engineering field requires using creativity to solve ill-structured, complex technical problems. People with ADHD have high rates of creative abilities and achievements [18]. The need for creativity in engineering motivates some recent Engineering Education Research (EER) studies on ADHD students. Taylor et al. and Zaghi et al. [19], [20] found that ADHD traits positively correlate with creativity. But divergent thinking, a key aspect of creative thinking, is an important aspect of engineering problem solving that remains disconnected from traditional engineering curricula, where creative solutions and innovation do not always positively affect academic performance. Taylor et al. [19] found that while ADHD traits did not predict students' overall GPA, they negatively predicted students' engineering GPA. Engineering GPA does not reflect creativity, so the strengths students with ADHD have are not reflected in exam scores either, further undermining the value ADHDers bring to engineering. The misalignment of ADHD traits and numerical academic assessment in engineering helps illustrate one way that engineering is less hospitable to ADHDers.

Fostering creative problem-solving in engineering curricula remains an important goal. Attracting and retaining neurodiverse engineering students and faculty, including those with ADHD, contributes to developing more creative, innovative, and effective engineering solutions and fosters equitable educational outcomes for diverse engineering practitioners [21]. However, not everything is rainbows and butterflies in the asset-based world of engineering ADHDers.

Asset-based framing can present individuals with ADHD as people who must prove why they deserve to be in engineering spaces *despite* their shortcomings. In other words, it frames ADHD as a condition with inherent negative traits that must be offset by positive traits that offer something new to neurotypical engineers. While framing ADHD individuals as those with positive, beneficial traits (assets) that could improve the engineering community may seem like a step in the right direction, it also reinforces the idea that there is a dominant, ideal engineer [22], and anyone who doesn't fit that idea is implicitly excluded. Some research that takes an asset-based approach to ADHDers [19], [20] emphasizes how their unique thinking patterns can benefit systems designed for neurotypical people.

Asset-based and insider perspectives of how ADHD engineering learners and practitioners make it through the system will help us understand what we need to change to make it more effective for the diverse learners that are showing up. It will also help us keep the ones that are here. While there are increasing realizations in engineering education literature regarding the ways less common engineering traits and identities positively contribute to engineering, we are still

working toward educational paradigms that intrinsically embed these traits as worthwhile/valuable into larger systems and structures. Our research aims to contribute to work outside the deficit-asset paradigm.

Given the increasing number of self-identifying and diagnosed ADHDers in engineering [27], the evolving de-stigmatization of the diagnosis, the increasing acknowledgment of the affordances provided by ADHD traits in creativity and problem-solving, and the recognition that changing traditional educational paradigms help learners connect and internalize challenging engineering course material [23], it is of timely importance that educators better understand how ADHD-having engineering students and faculty cope with traditional engineering education so we can target more effective ways of teaching and learning engineering to retain these groups and make our problem solving and solution generation more effective.

Using Collaborative Autoethnography to write a counterstory

In this section, we discuss how we intend to use collaborative autoethnography and various potential elicitation techniques to write our counter-story. The first stage of our study will focus on the experiences of professors and students in engineering education.

Autoethnography is the study of culture through autobiography. It lends itself well to studying the experiences of minoritized individuals while also providing a space for catharsis [24]. Collaborative autoethnography adds multiple autoethnographers' narratives, facilitating questioning and examining each other's data, promoting criticality and complementarity of findings, and adding transferability [25], [26]. Collaborative autoethnography (CAE) is well suited to understanding culture through individual human experience, helping to elucidate how less visible traits manifest through social interactions in different cultural spaces [24], [25], [27]. CAE will adequately capture the multivocality of our experiences allowing us to question one another to explicate our findings more comprehensively to readers [26].

Our study will be a liberatory praxis [15] that uses critical theories to study individuals with ADHD outside of deficit or asset-based paradigms. We will elicit experiences and narratives from individuals through interviews and reflective journaling. Through these autoethnographic reflections, participants will reflect on their engineering pathways and how ADHD manifested in said pathways.

Then, we will use counterstory to complexify and "reveal hegemonic, interlocking systems of oppression by showcasing the rich narratives, meaning-making, and lived experiences of those at the margins" [28, p. 74]. Counterstory also adds nuance to intersections between axes of oppression, privilege, and power. Alongside CAE, counterstory helps participants reveal aspects of normative society that don't work for ADHDers and make salient the ideas in the counter-narratives. This will allow us to define ADHDers by what they are instead of by what

they are not, facilitating intersectional healing. Throughout our inquiry, we will be mindful of addressing traumas attached to our identities by invoking the use of psychological therapy, supportive (chosen or biological) family and community, and one another when possible. Often, unpacking one identity can be like pulling on a set of intertwined knots [29]. Some of these knots contain experiences that have taught us to suppress our recognition of hegemonic, interlocking systems of oppression. Untying a knot undoes several intertwined threads that can leave a person exposed, vulnerable, and uncomfortable as they face sensitive aspects of themselves and their experiences they may not have intended to confront.

We are currently in the process of securing IRB approval for this study. We need to transparently articulate how all participant/co-author roles could be affected by power differentials due to professor/student roles. An additional layer of complexity is handling differing levels of experience with doing research, let alone reflecting on our identities in the context of ADHD traits. Lastly, we will be mindful of including other social identities, such as race and gender, in our investigation. The IRB at the institution we work with is curious about this work as it does not neatly fit into their previous research experience. They are helping move this research forward ethically.

We've listed areas of inquiry below, alongside example questions we intend to use. Once we reflect, we may conduct follow-up interviews with one another to delve deeper into our experiences. Then, we will construct a collaborative autoethnographic dialogue to investigate shared themes across our experiences.

Potential Elicitation Questions

In this section, we include some elicitation questions that could be used to answer our overarching research question: How can we reconceptualize ADHD in engineering beyond deficit frameworks through counterstory? These questions are intended to be used as a starting point for reflection and, with some refinement, could be used in an interview protocol or as reflective journaling prompts.

The questions are organized into sequential categories to progressively scaffold the reflecting individual's thought process. The sequence eventually builds towards a position where the individual is better equipped to imagine ADHD from outside deficit frameworks. Our intersecting identities affected the ways our families, social groups, and ourselves reacted to our ADHD diagnosis.

Categories 1 and 2 build context and establish a mutual understanding of the individual's identity, positionality, and experiences by asking them to consider how they relate to engineering and ADHD separately. Category 3 explores the individual's experiences with the intersection of their engineering education and ADHD traits. Category 4 investigates ADHD traits of the

reflector from a deficit/pathologization framework, establishing ways that the individual might be negatively othered through this paradigm. Category 5 investigates the individual's ADHD traits from an asset framework. It also provides the individual with a better understanding and awareness of the asset-based framework, which may be particularly influential due to the tacit nature of its othering. At this point, individuals should be in a better position than in the beginning of reflection to reconceptualize ADHD in engineering beyond the norms of deficit viewpoints. Category 6 encourages the questioning of cultural norms embedded in engineering spaces that do not work for individuals with ADHD. This involves the development of counterstories about ADHD engineers from the individual's experiences in their engineering education narrative. Lastly, the process of reflecting through elicitation questions culminates in category 7, where the individual is asked to envision implicitly ADHD-inclusive futures. In other words, the individual is invited to imagine a world where ADHD people are already considered in systematic structures as opposed to being pushed to the sidelines as an "other" population.

These elicitation questions are constructed for individuals already identifying with ADHD and engineering. Furthermore, we expect that the individual has put some degree of prior thought and reading into these topics. For example, it is implied that they are familiar with concepts such as neurodiversity and masking. Thus, prior knowledge may be necessary for the current versions of these questions to be effective. If a more general audience is desired, these questions may need revision before becoming the final questions involved in an interview protocol.

1. *Engineering Identity*
    - What does your identity as an engineer mean to you?
    - What do you conceptualize as a successful engineer? How does this compare with your conceptualization of ADHD?
2. *ADHD Identity*
    - What does your identity as an ADHD person mean to you?
    - How important is your ADHD identity to your sense of self?
3. *Intersection of ADHD and Engineering*
    - Describe how you experience the intersection of your ADHD and engineer identities.
    - How do your ADHD traits show up in your teaching/learning?
    - How much overlap do you consider your ADHD and engineer identities to have?
    - What boundaries or advantages have you experienced in engineering as an ADHD person?
    - How has ADHD emotionally affected your engineering education experience?
    - When in your engineering history did you start to accept your ADHD? How did this change your experience of ADHD?
4. *Deficit Framing*

- How have you navigated boundaries you have experienced as an ADHD person in engineering?
- What kinds of social stigmatization have you experienced as a result of your ADHD traits?
- What experiences have you had with attempting to hide or mask your ADHD in engineering spaces?
- How does your GPA correlate to your knowledge in engineering?
- How do you feel about ADHD being classified as a disability?

5. *Asset Framing*
    - What do you think are your strengths or advantages that come out of having ADHD? How did you feel about having these strengths?
    - What positive depictions of ADHD in engineering have you seen? What were they? How do they make you feel?
    - What affordances are you granted in engineering by virtue of your ADHDness?
    - In what ways are you proud of being an ADHD individual in engineering?
6. *Counterstory*
    - What feelings do you associate with ADHD?
    - Who were your role models in engineering? What identities did you share with them?
    - How often do you meet engineers who self-identify as neurodivergent?
    - What has it been like to become an engineering practitioner with ADHD?
    - Who supported you as you became an engineering practitioner with ADHD?
    - How were you supported to become an engineering practitioner with ADHD?
7. *Futurity*
    - What would a world that was built with you in mind look like?
    - How can we portray how ADHD impacts learning in the classroom to help others better understand what it's like to function and learn divergently?
    - What do you think is necessary for engineering spaces to become ADHD-inclusive?

We will ask these questions with respect to different spaces of social interaction in engineering. An ADHD engineering student's experiences and interactions in a classroom setting likely differ substantially from those of a more micro-scale setting (such as peer-to-peer interactions, group projects, and interpersonal interactions in third spaces) or settings in which the individual is working alone. Collecting data with attention to these areas of investigation will reveal more detailed thematic patterns in experiences of ADHD engineering education than otherwise.

This elicitation process aims to understand how ADHD engineering students and faculty make sense of their engineering education journey, what pedagogical and curricular aspects they deal with, and how they envision a future where neurodivergent learners are automatically considered

part of the system. With this richer knowledge, we can target ways of changing engineering curricula and pedagogy to make engineering education more equitable, inclusive, and effective.

Conclusion and Next Steps

This paper explored the literature in engineering education about ADHDers as we examined the various framings of these studies. We offered our combination of CAE and counterstory as a way to begin imagining a world where ADHDers are explicitly included in engineering. We offered elicitation questions that scaffold the interviewee's journey from deficit- to asset-based to counterstory and futurity. These questions hold the potential to help ADHD individuals reflect and come up with counterstories. By examining the output of these thought processes, we may begin to piece together a narrative of ADHD that does not imply the existence of deficits.

Once we receive IRB approval, our next step is collecting multiple qualitative data streams. This involves a small group of ADHD individuals reflecting on the elicitation questions and writing a record of individual thoughts. Then, we will analyze the stories collectively to examine themes or commonalities between responses. From these data, we aim to generate counterstories that will resonate with ADHD individuals. Through our work, we intend to strive for research with a worldview that imagines that not only is an accessible and disabled world possible, but it is also desirable.

During the collection of autoethnographic data, it is important to take reflections to heart. Autoethnography as a methodology is inherently personal and evocative [30]. For ADHD individuals, the framework through which you view ADHD (whether it be deficit, asset, or something else) is inextricably tied to your evaluation of your self-worth. If you navigate the world thinking you need to compensate for your ADHD, that makes it very hard to think you are worthy. There's a crucial difference between thinking you need to compensate, and knowing you don't need to compensate but that the world thinks you do. It is possible to simply exist as a human with inherent worth.

In the process of autoethnographic reflection, we may confront ideas or aspects of ourselves we haven’t had to question. Embarking on this work in our community may push on the way we conceptualize our own identities, as well as their interrelatedness. It is important for us to examine our conception of group identities critically. As part of this journey, scholars could face moments of cognitive dissonance that make it uncomfortable to critically examine our experiences and the society around us. The vulnerability required to do this work effectively requires fierce bravery and self-compassion.

Everyone stands to gain something from reflection and believing you have a space in a community. If you are starting from a place where you associate being different with negativity, it can be difficult work to believe being different is neutral. Eventually, knowing that difference

is good teaches you to love and accept yourself, and that comes hand in hand with building a better future for the neurodiverse community. As RuPaul famously says at the end of each episode of *RuPaul's Drag Race*, "If you can't love yourself, how in hell you gonna love somebody else?"

We encourage other scholars to investigate their (neurotypical and neurodivergent) thinking and learning processes, their identities, and how the connection between their neurodivergent traits and engineering practice affects one another. A potential avenue for future work is to expand the individual reflection and group analysis process to a larger group of ADHD participants within engineering spaces. This may help explicate how people choose to reconceptualize their narratives of ADHD to move beyond deficit framings. Our work will contribute to the better accommodation and celebration of neurodiversity as well as imagining a world where neurodiverse populations are implicitly included in the systems we navigate daily as engineers. Undoing the damage caused by deficit frameworks to neurodivergent individuals (individually, methodologically, and systematically) is central to intersectional healing.

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