Promoting Autism Inclusion and Representation in STEM: A Faculty Training

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Introduction

"Nothing about us, without us" has been a rallying cry in the disability rights movement for decades and a critique of the exclusion of disabled individuals from the crafting of policy decisions that affect their lives (Charlton, 1998). Autism advocacy organizations like the Association for Autism and Neurodiversity (AANE) have noted a need for more autistic voices and leadership in scientific research, where individuals with disabilities have higher unemployment rates, less access to funded research opportunities than individuals without disabilities, and constitute only 3% of the STEM workforce (NCSES, 2021; 2023). Individuals who identify as autistic, a disability characterized by differences in social communication, experience unique equity gaps. There are more students with autism enrolled in higher education now than ever before (Shattuck et al., 2012; Zeedyk et al., 2016). However, autistic students complete degrees at almost half the rate of the general population (38.8%, Newman et al., 2011) and unemployment/underemployment rates have been reported as high as 85% (Shattuck et al., 2021). Taken together, such data indicate that STEM fields, core drivers of innovation and the economy, are failing to recruit and retain autistic students. In order to create more equitable opportunities for autistic undergraduate students interested in STEM careers, specific and purposeful development efforts are necessary. Our goal is to broaden the participation of autistic individuals in the STEM workforce and enhance the climate for autistic inclusion in STEM, through the Promoting Autistic Inclusion and Representation (PAIR) program. The PAIR program will (1) provide faculty training on creating autistic-inclusive research environments, and (2) develop a comprehensive research mentoring program for autistic undergraduate STEM students that includes a supervised research assistantship, developmental workshops, and group and peer mentoring. Currently, our research team is developing the faculty training, described in the Current Stage of Project section.

Background

Systemic barriers to broadening the participation of autistic students in STEM. The extant research reveals systemic barriers that hinder the participation of students with autism in the STEM workforce and in particular in undergraduate research settings. Drawing from the research on systems change (Kania et al., 2018), we conceptualize barriers at three levels: structural; relational; and individual.

Structural barriers. Although federal regulations mandate that higher education institutions provide equal access and reasonable accommodations to facilitate student success (Hong et al., 2016), studies show that inadequate accommodations, decentralized campus resources, and the "impersonal nature of institutions" contribute to lower retention and completion rates for students with disabilities (Daehn & Croxson, 2021; Marshak et al., 2010; Parks & Schule, 2009; Wessel et al., 2009) and even more so for students with autism (Wei et al., 2015). Although there are many programs and resources dedicated to increasing the representation of women and students of color in STEM, fewer resources or programs exist that focus on students with disabilities in STEM, and/or the intersection of disability with other identities (Eriksson et al., 2007). Mentoring is a largely "unscripted" activity, with faculty members receiving little or no training in how to be good mentors in general (Griffin et al., 2010; Karalis et al., 2022; Kimball et al., 2016; White-Lewis et al., 2021) or for autistic students in particular (Gobbo et al., 2018; Sarrett, 2018); and relatively few forms of institutional oversight or accountability when mentoring relationships become unproductive or problematic (Posselt et al., 2020).

Relational barriers. Having a relationship with a faculty member is one of the largest predictors of academic success in STEM and pursuit of a STEM graduate degree (Batty & Reilly, 2022; Wineinger et al., 2022). However, because faculty members act as gatekeepers who wield significant power in determining who is recruited and retained into a lab (Posselt et al., 2020), autistic students may encounter power-based barriers in requesting, and receiving, accommodations that would foster their success in lab-based research settings (Kim & Crowley, 2021; Sarrett, 2018). In fact, autistic students report experiencing academic cultures that seem to devalue disclosure and/or asking for needed accommodations (Boularian et al., 2018) and many faculty report a general lack of awareness about autism (Zeedyk et al., 2019). These issues may hinder the ability to nurture important developmental relationships and access the networks that foster long-term success in STEM (Griffin et al., 2010, 2018).

Individual barriers. Despite the increasing visibility of autistic individuals in society, deficit-fueled stigmas and stereotypes remain a dominant barrier to full participation in STEM (Bettencourt et al., 2018; Dunn et al., 2012; Love et al., 2015; Gin et al., 2022; Zeedyk et al., 2019). Autistic students report experiencing stigmatizing behavior from faculty members in the classroom, including stereotype-based course content and dismissive behavior (Gelbar et al., 2015). Faculty members sometimes resist or refuse to provide accommodations, even when prompted by campus offices like Disabilities Support Services (Kim & Crowley, 2021; Sarrett, 2018). Moreover, even when faculty members express the willingness or desire to be more inclusive to autistic students, limited experience, lack of skill, and inadequate knowledge undermine faculty efforts (Love et al., 2015; Sarrett, 2018; Shmulsky et al., 2015). Such individual barriers interact with relational and structural barriers to maintain the status quo in STEM: research environments that systemically undermine and filter autistic students away from STEM career pathways.

Importance of disability and autism inclusion in STEM. There has been evidence showing a positive impact of STEM-focused interventions for college students with disabilities, including the modification of faculty attitudes and behaviors towards disability (Rule et al., 2011) and facilitation of positive self-concepts related to STEM learning for students with disabilities (Garrison-Wade, 2012). Increasing the participation of students with disabilities would therefore contribute to efforts to make the STEM academic environment more inclusive and welcoming overall. Specific to autism, autistic individuals bring significant strengths to the STEM field. While autism is heterogeneous, employers and faculty mentors of autistic individuals note significant strengths in attention to detail, sustained and intense focus on projects of interest, pattern recognition, and bringing unique perspectives (Morris et al., 2015; Shmulsky et al., 2019). Further, autistic individuals often show superior independence of thought, creativity, and affinity with technology (Krzeminska & Hawse, 2020). Taken together, STEM fields are currently missing the perspectives and skills of a talented group of individuals who could drive creativity and innovation across fields and disciplines and in society at large.

A systemic approach: Social model of disability. Given the systemic nature of these barriers, a systemic framework for change is required. The social model of disability (Barnes, 2000; Oliver, 1990) recognizes disability, including autism, as a social construct imposed by society, rather than a medical condition. The social model works towards creating an inclusive community to integrate unique individual differences, rather than fixing or normalizing one's disability (Haegele & Hodge, 2016). In line with the social model of disability, a key part of our proposed program will be a faculty-focused autism affirming training, in which faculty and lab staff will learn how to create more inclusive lab climates for autistic students.

Overall Plan

We have applied for a large external grant to fund a pilot of the entire PAIR program. We envision PAIR as a comprehensive mentoring program where autistic undergraduate students (4-6 per year) complete one-year research assistantship in a STEM lab. Over the course of the assistantship, PAIR mentees will participate in a structured mentoring program facilitated by the project team, while the faculty member who supervises the lab concurrently participates in an evidence-based mentor training program. The PAIR Program will be informed by the social model of disability (Oliver, 1990) which emphasizes changing the environment to be more inclusive of autistic students, rather than focusing on ways that autistic students can fit into neurotypical environments. It is also guided by research on mentorship, which acknowledges the importance of both career mentoring (e.g., technical knowledge, professional advice) and psychosocial mentoring (e.g., interpersonal support and acceptance; Kram, 1985; Ragins & Kram, 2007). As such, the planned program includes peer mentoring and networking, career development workshops, regular meetings with mentors, and mentor/faculty training.

Current Stage of Project

Through a modest internal grant, we are currently focused on one key aspect of our proposed program: *creating an autism-affirming training for faculty and lab staff*. Our goal with the training is to increase faculty knowledge and practice of autism inclusion and engagement via the development and implementation of autism-affirming training for faculty mentors and their laboratory staff. This training has the potential to significantly impact students in this program by providing an inclusive environment for them to develop their skills and realize their strengths as a research assistant. The training will also catalyze faculty uptake of inclusive mentoring and universally-designed lab policies and practices that will last beyond their participation in the grant.

To develop our training on autism-affirming research mentoring and practices, we recently completed a training needs assessment which necessitated focus group data from both faculty and autistic students.

Training Development. We followed best practices for training development by conducting a training needs assessment (Goldstein & Ford, 2002) primarily aimed at understanding:

- The skills needed: *what are the knowledge, skills, and attitudes do we want to see change faculty (and lab staff) after the training?*
- The people participating: *what level of skills, knowledge, and attitudes do faculty (and lab staff) currently have and where might we expect resistance?*

We conducted focus groups with 16 autistic students (graduate and undergraduate) who had experience in a STEM research lab or were interested in STEM. These students gave us insight into their experiences, their needs, and aspects of current labs that most need to change. Specifically, the answered nine questions focused on their experiences in higher education and/or in a lab setting (if relevant), including:

- Think about the way your lab is/was run (format of meetings, communication norms, physical space). What works well? What does not align well with your needs?

- How would you define what it feels like to be included or valued in a lab environment? Can you describe an example of an experience in a lab that made you feel included/valued?
- What kind of barriers (or facilitators) have you experienced in navigating different research opportunities? Things that help or hinder your goal?
- If you were in a lab setting, do you think you would ask for accommodations or modifications to your work, either formally or informally? Why or why not?

We also conducted focus groups with 14 STEM faculty and lab stuff, gaining insight on different ways that faculty construct their labs and where faculty and lab staff might lack knowledge or skills regarding inclusion of autistic individuals. Specifically, the answered nine questions focused on their lab practices and potential barriers to inclusivity, including:

- Have you ever accommodated or modified student work duties in the past, either through formal or informal processes? In what ways? If yes, how was that experience? If no, how do you think you would approach requests for accommodation?
- What do you do to make your lab as inclusive as possible for students with different identities and backgrounds?
- What is your experience mentoring or working with autistic students? Do you have other sources of knowledge/ experience?
- Are there any challenges you anticipate with including autistic students in your lab, which haven't come up yet in the discussion?

After transcribing the focus groups, 2-3 members of the research team read over each transcript and developed a list of training "targets", or general areas of knowledge, skills, and attitudes mentioned by the interviewees that would contribute positively to autism inclusion in lab environments (e.g., *Understand general/basic facts about autism; initiate conversations about accommodations*). We discussed this list as a group and developed a shorter list that reduced redundancies, resulting in 50 training targets. These 50 training targets were rated by all members of the research team on three criteria:

1. Is this objective **necessary** (will come up often in a lab setting, will have a big impact if done incorrectly or not done, will contribute greatly to the overall goals of autism inclusion in labs)?
2. Are faculty **proficient** on this objective already?
3. Is this objective **appropriate/feasible for training** (can this be addressed well through training, or is it more appropriate to address this via selection criteria, systemic change, training aimed at students, etc.)?

This rating process produced approximately 20 training targets that were rated as *highly necessary, highly appropriate for training,* and on which faculty *were lacking in adequate proficiency.* We settled on these training targets based on both examination of quantitative scores and a group discussion of any training objectives that were deemed important or redundant. Our research team then developed 35 more narrow training objectives, or specific goals for the training that can be measured (Goldstein & Ford, 2002). These training objectives fall under several key themes, described in the next section with representative samples given.

PAIR Training: Key Themes and Example Objectives. Our 35 training objectives fall into several key themes that will underlie the core principles of this project. Specifically, our training will educate faculty and lab staff to be:

- **A**ware of the Autistic Student Experience
    - Training Objective Example 1: *Faculty should be aware that autism is a neurodevelopmental disorder that is not confined to childhood and it is not an intellectual disorder.*
    - Training Objective Example 2: *Faculty should be able to identify multiple social pressures that exist within academia that push autistic students to mask in order to avoid stigma.*
    - Training Objective Example 3: *Faculty should be aware that autistic students may have a variety of social identities and be a part of overlapping marginalized groups (e.g. LGBT+, co-occurring disabilities (e.g., mental, neuro, and physical), racial, ethnicity, gender, religion, economic class, citizenship status.*
- **R**eady to Implement Accommodations Respectfully
    - Training Objective Example 1: *Faculty should be able to describe the main purpose of accommodations accurately and the definition of key terms (e.g., reasonable accommodations, implementation plan).*
    - Training Objective Example 2: *Faculty can accurately list at least 4 common accommodations that autistic individuals request in work and school settings.*
    - Training Objective Example 3: *Faculty should be able to create a process and/or set of practices for initiating conversations about accommodations that avoids singling any particular person out.*
- **C**ommitted to Creating Inclusive Lab Environments
    - Training Objective Example 1: *Given examples of lab practices, faculty should be able to distinguish which practices will lead to the greatest inclusion of autistic students.*
    - Training Objective Example 2: *Faculty should be able to identify at least 2 areas of their lab practices or procedures that would benefit from increased directness and clarity.*
    - Training Objective Example 3: *Faculty should be able to create a plan on how to modify at least one existing practice or create a new practice that will increase directness and clarity in their lab.*

Next Steps

We are currently creating training materials (e.g., handouts, lecture slides, hands-on activities) that will be directly linked to our training objectives. We have shared one initial training module for the University of Maryland Autism Research Consortium Advisory Board and incorporated their feedback. By Fall 2024, we plan to have an initial version of the full training program, which we plan to pilot the following academic year with STEM faculty and lab staff on our campus. We will determine training validity based on the extent to which participants meet our training objectives, via post-training surveys.

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