



Program to Assist Engineering Students with Autism Spectrum Disorder through Interdisciplinary Peer Mentorship (Experience)

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This experience report focuses on engineering students regarding the topic of inclusivity and retention by assisting students with autism spectrum disorder (ASD). With earlier diagnoses and comprehensive support in secondary school, more students with ASD are enrolling in science, technology, engineering, and math (STEM) curricula in college [1-3]. Students with ASD can encounter many obstacles when entering college [4]. Despite academic success in the coursework the student with ASD may face distinctive challenges in the classroom, such as sensory issues, or other needs like organizing assignments, time management, and peer mentoring, that are not addressed by traditional accommodations. All these challenges impact overall performance and present an impediment for the students to engage in the overall college experience. At Arizona State University we have developed a program for engineering students with ASD that is an interdisciplinary coordination between our Fulton Schools of Engineering college and College of Health Solutions. The program hires mentors from both colleges, engineering students and students studying ASD, to assist engineering students with ASD with executive functioning skills, finding resources, socializing, advocating for themselves and navigating the campus. ASD manifests differently in every individual. Therefore, the mentors follow a curriculum developed by the faculty, which is also personalized to individual needs. The mentors assess the needs of the student and apply the relevant strategies to each individual. The initial goal of the program is to better the students' academic and social experience in college and to increase retention of engineering students with ASD. This experience report will discuss this new program, lessons learned, how it is expanding, and provide comments and feedback from ASD students and mentors in the program.

Students with ASD in Postsecondary Education

Autism is a spectrum disorder that manifests itself differently in every individual from mild to severe symptoms. In recent years more children have been able to take advantage of support programs through elementary, middle, and secondary school, so more students with ASD are pursuing postsecondary education [1,5]. There is little research on the transition from secondary education to postsecondary education, which has contributed to a gap in their personal growth as students with ASD approach adulthood [6]. Students with ASD, who have had positive high school experiences, face additional difficulties in college due to changes in living situations, socializing with new students, and taking more responsibility for their educational success [4]. The student with ASD may face distinctive challenges in the classroom, such as sensory issues, executive functioning skills, difficulty communicating with others, trouble understanding certain forms of humor, and anxiety in social settings [2,4]. Some needs are easy to recognize and others are much more subtle. Typically, deficits in communication and social skills are present [7].

Students with ASD are enrolling in science, technology, engineering, and math (STEM) curricula in college, at a higher rate than the general population [2,3,8,9]. This can partially be explained by the high systemize to empathize ratio students with ASD typically exhibit, where empathizing is to have an emotional connection to other peoples' feelings, while systemizing is relying on a rules-based system [3,10]. Students with ASD develop a sense of belonging and more self-esteem when they have success in college courses with rigor [6]. In many instances the academic rigor is not the struggle for a student with ASD, but the surrounding environment and social endeavors can be formidable. Colleges and universities are starting to recognize the challenges ASD students face and offer additional support [6,11,12]. College students with ASD

need an individualized program with non-academic support services to address social-communication and executive functioning needs [12].

Postsecondary Accommodations

According to the Americans with Disabilities Act (ADA) a public institution cannot discriminate against individuals with disabilities [13]. However, colleges and universities do not have to follow the more rigid Individuals with Disabilities Education Act (IDEA) that is standard for students in elementary, middle, and high school [14]. Free and Appropriate Public Education (FAPE) guarantees the right of a child to be educated, therefore IDEA provides the supportive services to a child with a disability so that they can maintain their placement in public school [15]. Another difference at a postsecondary school is that a student with ASD must take more individual responsibility and self-advocate for their success at school [6,16]. The first step is to contact a disability services office at the school. The second step is to discuss with faculty any accommodations beyond those offered through a disability services office that may aid the student in the classroom, such as sensory issues or the ability to leave the classroom. These tasks can be very daunting for a student that may not have confidence in their communication skills.

Other accommodations that a student with ASD may need beyond what is offered at a postsecondary school are help with organizing assignments, time management, and peer mentoring [4]. Many instructors are open to classroom accommodations that will help students feel more comfortable in the classroom, such as reserved seating, allowing a student to leave the classroom when necessary, and warning of sensory stimulants such as bright lights or smells. Other modifications that an instructor can make to assist students with ASD are having an

organized class with a detailed schedule, making classroom materials available at least 24 hours before class, breaking large assignments into more manageable tasks with intermediate due dates, and allowing verbal assessments [17, 18].

Many ASD-specific programs exist at postsecondary institutions and these will continue to grow [14]. At Achieving in Higher Education with Autism and Developmental Disabilities in Pittsburgh, students at local colleges are given assistance with social interactions and time management, however they still meet the same academic requirements as other students [11]. The Autism Initiative at Mercyhurst in Pennsylvania provides an inclusive program with housing and field trips outside the state. The Burkhart Center for Autism Education and Research at Texas Tech University offers CASE (Connections for Academic Success and Employment) an all-encompassing wraparound program with employment assistance. More examples of similar programs across the country are detailed in Nachman [19].

The EASE Program

The student with ASD may face distinctive challenges in the classroom that are not addressed by traditional accommodations and can significantly impact the overall performance and enjoyment of the college experience. With the proper support each individual student with ASD can be successful in college and beyond. The Employment Assistance and Social Engagement (EASE) program at ASU is a program that offers support for engineering students with ASD. EASE is an interdisciplinary effort involving faculty and students in the Fulton Schools of Engineering and the College of Health Solutions at ASU.

EASE is designed to provide student success support for engineering students with ASD through their entire academic tenure and transition into an engineering career. The program affords a solution for equipping students with ASD for success. Its overarching goal is to better the students' academic and social experiences in college, and offer continued support into starting a career that helps the student grow and gain professional skills that contribute to maintaining the job.

The EASE program addresses diversity, equity, and inclusion by improving student recruitment and retention for engineering students with ASD. This program also fosters a culture of inclusion for students on the spectrum. Having a diverse student population also influences the students working alongside students with ASD. Diverse learning peers lead to more compassionate, well-rounded students at the university level and as future employees.

EASE is currently implementing a peer mentoring program to help with the transition from high school to university life. The peer mentoring program includes support from a College of Health Solutions peer mentor; i.e. undergraduate or graduate student; to support communication and behavioral growth, and a peer mentor from the Fulton Schools of Engineering to support academic related questions and growth. The EASE program is also developing a summer bridge program for incoming students with ASD. The summer program will have the students visit the campus and meet their mentors, discuss resources available to the students, introduce possible instructors, and take a tour of the campus pointing out quiet places.

EASE is an individualized support system. The initial meeting between mentor and mentee focuses on current services and supports the student is receiving, concerns, strengths, interests, and goals. Through peer mentoring students with ASD work on executive functioning; i.e. time management, study skills, organization, and communication and behavioral skills such as leadership and self-advocating. The mentors gain training experience in these areas as well. The faculty team has bi-weekly meetings with the mentors to check on student attendance and progress in the program. The team also offers advice on how to approach different topics such as talking to a professor, time management, approaching homework, and also suggests life and social skill strategies, coordinates resources, and hosts social events.

The EASE program differentiates itself from other programs in several ways. The program started as an interdisciplinary collaboration between two faculty members in different colleges at ASU. One faculty member is from the Fulton Schools of Engineering and the other is from the College of Health Solutions. Both faculty members volunteer their time for this program. The Fulton Schools of Engineering supports the peer mentors and both colleges support students to work with the faculty on curriculum. For these reasons, the program is completely free to the students who participate. This was a founding principle of the program and one we intend to keep. Students with ASD come from different backgrounds and we do not want to exclude any students based on affluence.

Results and Lessons Learned

The number of students with ASD at ASU has more than quadrupled in the last ten years.

The EASE program has grown from one mentor and one student in spring 2020 to two mentors and nine students in spring 2022. The program started just as the COVID-19 pandemic hit in spring 2020, so all interactions were online until fall 2021. In fall 2021 the mentors were able to hold more in-person interactions, which has been very beneficial for the mentees. The peer mentors are able to find appropriate resources and guide the students through their academic life and navigating the college campus. The peer mentors are good at setting boundaries and expectations for the students for their mentor/mentee relationship. Since spring 2020 we have started using an expectation agreement for mentees to know that their participation in the program is required. Also, finding other means of communication, besides email, has been incorporated into the program. At the end of every semester we have the mentees and mentors fill out a survey about the EASE program.

Select responses from the peer mentee survey are shown below.

- Your participation in the EASE program has improved your ability to utilize your time efficiently:
 - “Me and one of my peer mentors came up with a matrix on how to prioritize my tasks using my planner according to how urgent and important they are. As I write this, I have only been using this matrix for a week but it does help quite a bit on prioritizing my tasks.”
 - “I am thinking of many different ways to utilize my free time based on the urgency of my assignments from my classes.”
- Your participation in the EASE program has facilitated your success, specifically with regards to the punctual and satisfactory completion of goal-oriented activities:

- “Whenever I have an issue I bring it up during a mentor meeting and we work to find a solution.”
- Your participation in the EASE program has positively impacted your academic performance:
 - “Having two peer mentors to talk to has really helped my mood when it came to this year. Safe to say it has helped a bit with my academic performance.”
- Do you have any suggestions pertaining to the betterment of the program?
 - “Keep helping students like me find ways to manage their time and understand what they want to do in their future and how to achieve it.”

Select responses from the peer mentor survey are shown below.

- Your involvement and interaction with mentees in the EASE program has facilitated their success, specifically with regards to the punctual and satisfactory completion of goal-oriented activities:
 - “A student said that they tended to spend too much time on assignments because they worried they were not good enough. I talked with them about the root causes of their worrying and ways to avoid spending excessive amounts of time on work. We talked about setting specific blocks of time for school work, with breaks between blocks for walks outside their dorm, and setting a time limit for editing assignments.”
- Your involvement and interaction with mentees in the EASE program has fortified their self-advocacy skills:
 - “I think we indirectly fortified their self-advocacy skills. We didn’t discuss disclosing students’ ASD to professors. Instead, we gave advice about advocacy relating to

asking for help on assignments from TA's and professors, and creating a resume that communicates their strengths well.”

- “I have always been vocal, clear, and honest about the importance of believing in one's abilities.”
- Your involvement and interaction with mentees in the EASE program has positively impacted their academic performance:
 - “One of our mentees was struggling academically. Throughout the semester they've been communicating their improvements, which have been for the most part, based on our advice.”
- Your involvement and interaction with mentees in the EASE program has strengthened their interpersonal skills:
 - “The mentees had very strong communication skills when they entered the program. By expressing our confidence in the students, the students appeared to become more assertive and self-assured. One student began communicating much more with the tutors, who were able to help them on their assignments.”
 - “I know many of the students were nervous about meeting with me for the first time, but throughout the semester have become much more comfortable with our social interaction and that has helped them continue to branch out with others as well.”
- Your involvement and interaction with mentees in the EASE program has increased their functionality within a neurotypical educational setting:
 - “The students already appeared to function relatively well in neurotypical education settings. Most of the improvement I saw across the students were related to executive function (i.e., organization and time management). Another important component we

implemented was validation. We made sure to let students know their strengths and achievements, and I definitely saw their confidence increase.”

- Your involvement and interaction with mentees in the EASE program has represented a meaningful dedication of your time and energy:
 - “I love what I do.”
 - “This has been an amazing experience so far and I am looking forward to next semester!”

Conclusion and Future Work

At ASU we have a new program to assist engineering students with ASD with skills, advocacy, and resources beyond a typical university disability services office. The program is unique in that it is a collaborative effort between the faculty and students from the Fulton Schools of Engineering college and the College of Health Solutions at ASU, and it is a free service for engineering students with ASD. The program has grown over the last two years and as the pandemic eases more face-to-face interactions and activities are being developed.

The next phase of this project focuses on increasing coordination with industry and career-readiness of engineering students with ASD. Quality preparation during the job search process contributes to the success of students with ASD to find meaningful employment. In the future, EASE aims to promote the engineering community and local engineering companies by increasing persistence and employment statistics for students with ASD.

References

- [1] R.E.A. Nevill, and S.W. White, “College students’ openness toward autism spectrum disorders: improving peer acceptance,” *Journal of Autism and Developmental Disorders*, vol. 41, pp. 1619-1628, 2011.
- [2] M. Pilotte and D. Bairaktarova, “Autism spectrum disorder and engineering education – needs and considerations,” 2016 IEEE Frontiers in Education Conference, pp. 1-5, 2016.
- [3] X. Wei, J.W. Yu, P. Shattuck, M. McCracken, and J. Blackorby, “Science, technology, engineering, and mathematics (STEM) participation among college students with an autism spectrum disorder,” *Journal of Autism and Developmental Disorders*, vol. 43, no. 7, pp. 1539-1546, 2013.
- [4] A. Hillier, J. Goldstein, D. Murphy, R. Trietsch, J. Keeves, E. Mendes, and A. Queenan, “Supporting university students with autism spectrum disorder,” *Autism*, vol. 22, no. 1, pp. 20-28, 2018.
- [5] K. Gobbo, and S. Shmulsky, “Faculty experience with college students with autism spectrum disorders: a qualitative study of challenges and solutions,” *Focus on Autism and Other Developmental Disabilities*, vol. 29, no. 1, pp. 13-22, 2014.
- [6] D. Hart, M. Grigal, and C. Weir, “Expanding the paradigm: postsecondary education options for individuals with autism spectrum disorder and intellectual disabilities,” *Focus on Autism and Other Developmental Disabilities*, vol. 25, no. 3, pp. 134-150, 2010.
- [7] M. Wheeler, “Academic supports for college students with an autism spectrum disorder: an overview,” Retrieved from <https://www.iidc.indiana.edu/pages/Academic-Supports-for-College-Students-with-an-Autism-Spectrum-Disorder>, 2014.
- [8] X. Wei, E.R.A. Christiano, J.W. Yu, J. Blackorby, P. Shattuck, and L. Newman, “Postsecondary pathways and persistence for STEM versus non-STEM majors: among college students with an autism spectrum disorder,” *Journal of Autism and Developmental Disorders*, vol. 44, pp. 1159-1167, 2014.
- [9] X. Wei, J.W. Yu, P. Shattuck, and J. Blackorby, “High school math and science preparation and postsecondary STEM participation for students with an autism spectrum disorder,” *Focus on Autism and Other Developmental Disabilities*, vol. 32, no. 2, pp. 83-92, 2017.
- [10] S. Baron-Cohen, “Autism: the empathizing-systemizing (E-S) theory,” *The Year in Cognitive Neuroscience 2009*, vol. 1156, pp. 68-80, 2009.

- [11] E.F. Farrell, "Asperger's confounds colleges," *The Chronicle of Higher Education*, vol. 51, no. 7, pp. A35, 2004.
- [12] J. Kuder, and A. Accardo, "What works for college students with autism spectrum disorder," *Journal of Autism and Developmental Disorders*, vol. 48, pp. 722-731, 2018.
- [13] U.S. Department of Justice, Civil Rights Division, Disability Rights Section, "*A Guide to Disability Rights Laws.*" February 2020 Accessed on: March 26, 2022. [Online]. Available: <https://www.ada.gov/cguide.htm#anchor62335>.
- [14] S.M. Robertson, "Postsecondary education & autism: developing an online community," 2007 IEEE Symposium on Visual Languages and Human-Centric Computing, pp. 266-267, 2007.
- [15] E. VanBergeijk, A. Klin, and F. Volkmar, "Supporting more able students on the autism spectrum: college and beyond," *Journal of Autism and Developmental Disorders*, vol. 38, pp. 1359-1370, 2008.
- [16] D. Adreon, and J.S. Durocher, "Evaluating the college transition needs of individuals with high-functioning autism spectrum disorders," *Intervention in School and Clinic*, vol. 42, no. 5, pp. 271-279, 2007.
- [17] D. Delp, "WIP: Practical applications for students with autism spectrum disorders in the freshman engineering curriculum," 2021 ASEE Virtual Annual Conference, 2021.
- [18] L. Barnar-Brak, D. Lectenberger, and W.Y. Lan, "Accommodation strategies of college students with disabilities," *The Qualitative Report*, vol. 15, no. 2, pp. 411-429, 2010.
- [19] B.R. Nachman, C.T. McDermott, and B.E. Cox, "Brief Report: Autism-specific college support programs: differences across geography and institutional type," *Journal of Autism and Developmental Disorders*, vol. 52, pp. 863-870, 2021.