Augmentative and Alternative Communication Devices and Neurodivergence: Creating Inclusive Learning Environments Through Technology

Abstract

Augmentative and alternative communication (AAC) devices have the opportunity to transform the lives of individuals with complex communication needs (CCN). For neurodivergent learners who use AAC to communicate, their acquisition of language and literacy is often dependent on the tools they use and the amount of support and intervention they receive. Through research and analytical studies, this article will explain the opportunities afforded to neurodivergent learners through the inclusion of AAC devices and the effects they can have both short and long-term. The information provided, I hope that after reading this article, educators will better understand the benefits gained by AAC devices amongst their neurodivergent learners and the challenges of not only integrating this technology in the classroom, but also advocating for its continued improvement.

Introduction

Picture yourself sitting in a classroom, where the educator is presenting learning scenarios. You hear your classmates respond, yet you are hesitant to communicate a response or feel unable to do so effectively. How do you think this would affect you as a learner and your feelings regarding participating in your learning environment? Many of us can speculate and assume about this, but we know that it's not our experience. However, this is the reality for many neurodivergent learners as they navigate through their respective learning environments. As the parent of a neurodivergent child, I have witnessed my son's educational journey and the frustrations he has had to endure at times from a lack of communicative understanding and the tools necessary, technologically and others, to bridge the gap between the learner, their learning environment, and the educator.

With technological advancements leading the way in our society in every field, the educational field has had the opportunity to be more aware of and begin the utilization of technologically advanced education tools. These tools can drastically alter what learning environments have and should look like for neurodivergent learners as opposed to neurotypical learners, better assimilating the two together as all-inclusive environments. The AAC device has been one such tool that has assisted neurodivergent learners in their respective learning environments, and the continued advancement in technology has further enhanced the capabilities of such devices. Technological advancements in today's

education climate have made it impossible for education administrators and educators to minimize the benefits and need to incorporate technological education tools into the classroom learning environment on a routine, permanent basis. For neurodivergent learners, this is and has been a critical need that has gone underserved for too long. As we dive into this topic, I will highlight the issues our neurodivergent learners face inside the classroom, the benefits AAC devices offer, and where the coupling of educators and technology can take the learning experience for neurodivergent learners going forward.

Growing in numbers not support: neurodivergent learners

Neurodivergence is not a medical term and does not refer to a specific diagnosis but instead can incorporate a range of identities and diagnoses, including ADHD, epilepsy, psychiatric illnesses including depression and anxiety, Multiple Sclerosis, Parkinson's, learning disorders, and dyspraxia (Misgen et al., 2024, par. 1). So, when we hear/see the term neurodivergence being utilized, it's not about one particular person or diagnosis but rather a community of individuals that include both shared and unalike difficulties in expression and communication. One-third of Americans (32%) know what the term neurodivergent means without it being previously defined, according to a recent YouGov poll. A majority of Americans (56%) weren't sure how to define the term (Healy, 2024, par.2). Lack of awareness and knowledge of neurodivergence has played a major role in the failure to properly support neurodivergent learners in their respective learning environments. To properly establish substantial learning environments for their neurodivergent learners, educators must understand the barriers faced by those individuals and be able to notice signs that a student who doesn't identify as neurodivergent but just may be. 19% of Americans identify as neurodivergent, with many believing the number is closer to 30% (Healy, 2024, par. 4). Much of the knowledge or awareness of neurodivergence is only now appearing in the last few years, and this information affords educators insight into the obstacles both known and unknown by their neurodivergent learners.

Barriers, obstacles, and difficulties

Education can be a complicated and isolating experience for neurodivergent students. Many systemic barriers and injustices create challenges for the accessibility and inclusivity of learning environments and curricula (Butcher & Lane, 2024, par. 1). These challenges are exacerbated by the fact that the neurodivergent community is made up of a diverse group of individuals with diverse challenges. Issues for neurodivergent learners range from overstimulation, sensory surges, social anxiety, communication issues, and the ability to focus.

Overstimulation

When overstimulated, neurodivergent students struggle to take in information, focus, and learn. Students often have little control over the set-up of classrooms, labs, and social spaces, and may not be able to adapt them to meet their sensory needs. With tight schedules, they often must go from one overstimulating place to another.

Sensory surge

Sensory processing differences can affect neurodivergent students' participation and experience in courses. Neurodivergent students may be overloaded more easily by sensory input, including lights, scent, background noise, and temperature, leading to sensory surges.

Social anxiety

Neurodivergent students report anxiety about interacting with others. They are ostracized, bullied by their peers, and struggle with interpreting and responding to social cues. This can make group work, partnered activities, or collaborative projects difficult.

Communication

Many neurodivergent students struggle with verbal and written communication. When expectations are implicit, neurodivergent students may not pick up on them. If instructions are only given orally, students may not understand the cue and may over-contribute or under-contribute based on a lack of understanding. Neurodivergent students may also struggle with the norms of professional communication, or may not have the ability to engage in what is considered professional communication.

Focus

Students with various forms of neurodivergence may struggle to direct their focus, break tasks down into parts, effectively plan their work, and estimate how much time tasks will take. In addition, they may struggle to find systems that enable them to effectively manage the tasks of daily living.

Transformative capabilities: Augmentative and alternative communication devices

As neurodivergent learners navigate through their barriers and educators look for ways to minimize the challenges that they face in the classroom, Technological advancements have provided a monumental support tool in the form of the AAC device. For neurodivergent students with speech delays or CCN, many rely on AAC devices to

communicate with their peers. Considering language and the ability to communicate using language, is central to literacy learning; students who use AAC must have access to the tools and strategies they need to be successful (Kopinsky, 2022, par.2). The Creation and utilization of AAC devices amongst neurodivergent learners have assisted greatly in improving the abilities of neurodivergent learners and the capabilities of educators to engineer substantial learning environments for their neurodivergent students. ACC devices of all kinds have been utilized by neurodivergent individuals, and everyone has a preference based on what they need or feel that they need to communicate effectively. Any method that is used by both kids and adults that can help a person communicate counts as AAC. That includes many systems and devices, such as communication boards, speech-generating devices, computer apps, and picture books (Barnes, 2024, par 1). Each method or version of ACC comes with a unique style and set of capabilities that are geared toward assisting individuals to communicate and express themselves. There are three terms used to describe AAC methods.

- High-tech AAC- electronic forms of AAC, such as a speech-generating device or an iPad with apps.
- Mid-tech AAC- battery-operated devices with simpler functions, such as a limited number of pre-programmed messages.
- Low-tech/ no-tech- non-electronic forms of AAC, such as paper and pen, a whiteboard, or customized paper-based materials with pictures of items or words/phrases. It also includes AAC using one's body, such as by gesturing or pointing.

The focus of this study is to utilize the maximum capabilities in AAC device technology, and for that, I'm going to focus on the high-tech AAC methods. The high-tech devices are more complex and utilize a higher level of technology. Oftentimes, there can be a concern about the overall usability of such high-functioning tools from their users and family members. However, the tools are designed to seamlessly connect with the user. Professionals have been studying AAC for years, so we've learned a lot about how AAC helps people communicate. Through research, AAC high-tech devices are designed to better understand the user's capabilities as it pertains to skills, motivation, and mobility. In addition to informational resources about each form of high-tech AAC devices, to better decide on what devices to go with, another resource is professional counsel. A Speech-Language Pathologist and clinical doctor can help find the right AAC system for you or your loved one. They also help you and the people you talk with learn how to use AAC to communicate. They will work with other professionals like occupational therapists and physical therapists if you have different physical skills that affect how you access your AAC system (Barnes, 2024, par. 5).

Viable AAC options

- (A) Pocket Go-Talk 5-Level Communication Device: A compact 25-message talker with five easy-to-activate buttons and five levels. Each message has 12 seconds of recording time. Lightweight and small size make Pocket GoTalk very portable. It has a larger speaker than the other GoTalks, so it plays back speech at a higher volume. Scanning through switch access is also built-in for table-top use, with five adjustable scanning speeds. Pocket GoTalk lets you change level five to a one-minute message. Great for the Pledge of Allegiance!
- (B) The MegaBee Assisted Communication and Writing Tablet: Designed specifically for users who, due to ALS, a traumatic brain injury, stroke, ALS, muscular dystrophy, etc., are unable to use most of their body's voluntary muscles. The device is held by the listener who looks through the opening in the center of the device to view the direction of the user's eye movements. A series of colored buttons allows the listener to push them as the user moves his or her eyes, first at one of six colored blocks, and then at a specific color (representing a letter) within that block. The goal is to spell out what the user wants to say on the LCD screen. The device also features a shorthand option, so the user and listener can come up with a personal set of abbreviations for their most commonly used terms.
- (C) Roloquo2Go: AAC app that enables non-speaking children and adults to express themselves confidently and initiate conversations. With more than 27,000 symbols, Proloquo2Go enables users with varying literacy levels to communicate effectively through easily recognizable images. Proloquo2Go features over 100 free, natural-sounding voices in English, Spanish, French, and Dutch. It supports multiple accents and bilingual use, including switching languages mid-sentence.
- (D) Enabling Devices Tactile Symbol Communicator: portable symbol communicator, which can store up to 36 messages, has a total of six removable tactile symbols that allow the user to push a button to relay a message. As a tactile symbol communicator, it is perfect for users who are blind or visually impaired. The device offers six levels of communication, with six messages per level. When setting up this device, it provides up to six seconds of record time per message.
- (E) GoTalk Express 32 – Advanced Communication Aid: This laptop device features a grid of pictures that allow users to combine them to form sentences. It features two methods of operation: standard and express. When the standard method is chosen, the user simply presses a message key and the device speaks the word. When the express method is chosen, the user can press multiple message keys to create a sentence. Some of the other features of this device include a shoulder strap for easy carrying, a rugged design with a carrying handle, and LED lights for visual prompts.

Research and results

A major stream of AAC research has focused on studying everyday conversations involving people and AAC. This research has tended to adopt either quantitative, distributional perspectives of interaction, focusing on quantifying the use and functions of language, or qualitative perspectives, providing insights on the ways that social actions are achieved in everyday conversations through conversational analysis (Ibrahim et al. 2023, par. 1). Studies like this take recorded accounts of social interaction between neurodivergent students and non-divergent students, as well as neurodivergent students and their respective educators to highlight the differences between the three groups based on having the assisted capabilities of the AAC devices versus not having it. This study was encapsulated with 10.5 hours of recorded video footage over 14 weeks. In conclusion, the study found that with the inclusion of AAC devices, children were able to regulate power dynamics by establishing common task interests, mutual understanding of what both participants were expressing, and could pick up the signs of what the other was intending. Often, by combining multiple modes, children could express themselves for a broader range of functions, could regulate shades of intensity, and were able to advance their interests to a greater extent (Ibrahim et al., 2023, par.20). These particular findings showcase the major influential difference between students having the ability to blend technological communication with motion communication. When dealing with neurodivergent learners, the aspect of communication awareness is where the biggest difference is made, which is why the AAC device is so critical in a neurodivergent student learning environment. Taking from the study, there is a clear disconnect when students are utilizing more traditional communication methods. by focusing on the persuasive ways that children expressed themselves during particular tasks through full bodily action, as an important component of interactional activity. In the case of one child participant, Grace, bodily action coupled with the adult conversation partner's sensitivity to her actions, enabled Grace to arrange her environment in ways that made it possible for them both to access the tabletop craft task more readily (Ibrahim et al.,2023, par. 27). By having a heighten level of sensitivity and display good communication awareness the educator was able to pick up on the learner's bodily movements couple with the AAC device to create a better functioning learning environment for the student. This level of attention will be critical in the further implementation of AAC devices into learning environments on a permanent basis. The findings have several implications for school staff and therapists who are responsible for supporting the communication and learning needs of children who use AAC. By being equally sensitive to a wide range of modes, the findings showed

that it was possible to focus on interactional features that might traditionally have been treated as secondary to talk (Ibrahim et al., 2023, p.10).

As important as the in-school aspect of these studies is, for programs like the study mentioned above and my innovation plan program, it can't just be about the learning institutions, but the families that go through these things daily as well. It is vital for a child who uses AAC and his or her family to be active members of the intervention team, to support the learning process and promote successful outcomes (McNaughton et al., 2009, p. 1) This aspect plays a huge role, as many neurodivergent individuals and their families lack the resources or means to be able to acquire the needed technological tools like AAC devices. Despite the potential communication "magic" of AAC technologies, there are significant learning costs, and typically the device is just one part of an individual's AAC system (McNaughton et al., 2009, p. 1). In a research study conducted by David McNaughton and his peers, they compiled a focus group made up of neurodivergent individuals and their family members. The focus groups were led by the neurodivergent individual. Letting the group study be led by the actual learner gave the research team a rare perspective that few studies have attempted to cover, and included in the overall synopsis of the benefits AAC devices offer and the work that still needs to be done to develop fully substantial, all-inclusive learning environments for neurodivergent learners. Some of the major end-result findings highlighted by McNaughton and his team:

1. Parents noted that practice with the AAC device produced gains in unexpected areas, for example, using the device for many hours, listening to the voice over and over, actually helped some learners' overall vocalizations.
2. Parents discussed the helpfulness of technology supports built into AAC devices that facilitated independent development traits through usage assistance tools.
3. The grave need for professional development amongst educators and other health aids to be able to properly connect with the learner
4. Professionals who deliver AAC-based services need to be provided with pre-service and in-service training that focuses on the problem-solving and communication skills required to work effectively as part of a team.

Conclusion

With continued improvements in technology and the growing advocacy efforts to equip neurodivergent learners with everything they need to have a learning environment that they feel fully included in, I feel that progress is being made. However, studies and research show a critical need for more direct, driven efforts. Educators, administrators, and family communities have to continue to work as one. As both a parent and educator, my

innovation plan is designed to build off the extremely helpful research and case studies like the two highlighted to further advance what capabilities can be added to AAC devices in the future, while creating monumental changes for neurodivergent learners in the present.

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