Augmentative and Alternative Communication Devices

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Augmentative and Alternative Communication (AAC) devices are important assistive technology tools that help individuals with various communication needs express themselves. AAC tools support students who have severe speech or language impairments due to conditions such as autism spectrum disorder, cerebral palsy, apraxia of speech, developmental disabilities, stroke, or degenerative diseases such as ALS. The main goal of an AAC device is to enhance communication, social interaction, and independence. These devices allow individuals to express wants, needs, emotions, and thoughts.

The development of Augmentative and Alternative Communication (AAC) has evolved over more than five decades. During this time, advances were made in linguistics, psychology, rehabilitation science, and computer technology. In the 1950s and 1960s, individuals who had severe motor or communication impairments typically lived in large institutions and were excluded from mainstream education and social participation (Light & McNaughton, 2012). The early strategies used to facilitate communication involved unaided methods such as gestures and manual sign systems adapted from American Sign Language. These methods were the first official attempts to add to or replace natural speech for individuals with communication impairments.

In the 1970s, experimentation began with the use of symbols or pictures that were arranged on communication boards. The individual would point to an image that showed a basic object, action, or emotion. This allowed individuals to communicate without using speech. It was during this time that the term augmentative and alternative communication began to be used to describe this type of communication. According to Light and McNaughton (2012), the establishment of the International Society for Augmentative and Alternative Communication

(ISAAC) in 1983 marked a turning point in validating AAC as a professional and research discipline.

Major innovations in technology occurred in the 1980s and 1990s. Speech-generating devices that could vocalize a preprogrammed message or word that was selected from a display were developed due to advances in microprocessor technology. These types of devices were the first to incorporate both a visual display and a voice output. They transformed augmentative and alternative communication from still pictures to interactive tools for communication. Light et al. (2019) describe this period as the "foundational technological era" of AAC. During this time, accessibility features like switch scanning and eye-gaze input began to emerge for users with severe motor impairments.

In the early 2000s, digital and mobile computing technology was combined with augmentative and alternative communication, which made these devices portable and able to be customized to each individual's needs. The invention of touch screen tablets in the late 2000s made AAC more accessible and affordable for schools and families (Light et al., 2019). Applications available on these devices offered speech synthesis, symbol libraries, and customizable interfaces at a fraction of the cost of earlier dedicated devices (O'Neill et al., 2018).

After 2010, research on AAC began to focus on improving language development and social participation instead of just providing an alternative way to communicate. Research has shown that AAC enhances literacy, academic engagement, and peer interactions (Light & McNaughton, 2012). Modern tools are beginning to incorporate artificial intelligence, predictive text, and cloud-based storage to personalize vocabulary and improve the efficiency of communication (Light et al., 2019). The new AAC devices help with basic communication along with conversational skills, self-expression, and academic achievement.

There are many different types of AAC systems. They range from simple low-tech tools like communication boards to high-tech computer-based systems that can generate speech. These devices support or replace spoken communication depending on the needs of the individual. These devices are classified into two categories. The first is aided versus unaided systems, and the second is the levels of technological complexity (Light et al., 2019).

Unaided AAC uses gestures, manual signs, facial expressions, and body language to communicate. This is a good economical way of communication for individuals who have intact motor abilities but have limited verbal communication skills. Systems such as signing or using gestures rely on an understanding of the system by both people who are communicating, making this an ineffective system to use when not everyone understands the signs or gestures (Light & McNaughton, 2012).

Aided AAC systems require the use of an external tool or device. When an individual uses an aided AAC device, they choose a symbol, word, letter, or picture that represents what they want to communicate. Some devices require the user to touch the image or press a button. Other devices use eye tracking or head pointing technology. The mode in which the individual uses the device is matched to their specific needs and abilities. Once the individual has selected a word or symbol, the device translates that input into a message. The device will then produce an output. On some devices, this may be a message displayed on the screen or actually speaking the message out loud through a speaker that is on the device. Many devices have common phrases and words pre-programmed so communication can happen fast and feel natural.

Low-tech AAC systems are non-electronic, portable, and inexpensive, which makes them a good choice for young children and settings where there is limited access to technology. These tools include communication boards, notebooks, picture symbol cards, and visual schedules.

Boardmaker is one example of a low-tech communication system. It includes over 85,000 color picture communication symbols that are designed to support individuals with diverse communication needs. This type of system helps students with autism spectrum disorder or developmental delays participate in classroom activities by providing a visual representation of concepts, routines, and vocabulary (Iacono et al., 2016).

The next category of AAC is mid-tech devices. These types of devices have limited electronic features. Mid-tech devices include some electronic features, such as recorded voice messages or buttons activated by switches. Some examples of mid-tech devices include GoTalk, BIGmack, and Step-by Step communicator. These devices play a pre-recorded phrase or response when the user presses a button. These types of devices are often battery-powered, making them portable, but they do not have an interactive screen display. Mid-tech devices are useful for having students make choices and for participating in repeated classroom routines such as roll call or call and response activities. Mid-tech tools use human-recorded voices so they sound more natural than most text-to-speech devices (Elsahar et al., 2019).

Building on the foundation of low and mid-tech systems, high-tech AAC devices combine sophisticated software and hardware to provide customizable communication options for users with diverse needs. These devices represent the most advanced form of augmentative and alternative communication, using digital technology to generate speech and support complex language expression. High-tech AAC devices are typically tablet-based applications that can produce artificial or recorded speech when the user selects a word, symbol, or letter from the display. Dynavox and Lightwrite are two examples of early speech generators. These devices had a fixed display and included a pre-programmed vocabulary. Modern high-tech AAC devices have integrated interactive displays, language prediction algorithms, and multifunctional input

options including touchscreens, eye-gaze tracking, and switch scanning. According to Light et al. (2019), the development of mobile technologies and cloud-based AAC software has transformed accessibility, allowing speech-language pathologists and teachers to customize vocabulary sets, interface layouts, and symbol libraries for each student. Proloquo2Go, LAMP Words for Life, and TouchChat HD are examples of high-tech AAC applications. These applications include a set of frequently used words and content-specific vocabulary. These high-tech devices can also support multiple languages, voices of different genders and ages, and the ability to be used with digital whiteboards and online learning platforms.

AAC devices are used to assist individuals who have difficulty producing or understanding spoken or written language. There are many different disabilities, conditions, or injuries that can affect speech and motor abilities. These tools are commonly used to support individuals with developmental disabilities, including autism spectrum disorder, cerebral palsy, Down Syndrome, intellectual and developmental disabilities, and childhood apraxia of speech (Light & McNaughton, 2012). There are also many other injuries or conditions that are acquired by individuals. These conditions include aphasia following a stroke, traumatic brain injury, amyotrophic lateral sclerosis (ALS), Parkinson's disease, and Multiple Sclerosis (Light & McNaughton, 2012). There are also various physical or medical conditions that restrict voice output, such as muscular dystrophy, spinal cord injury, tracheostomy, or laryngectomy, that are supported by AAC devices. These devices are important for the communication needs of any individual who has difficulty with communication. AAC devices are essential for supporting participation, literacy, and social inclusion in addition to allowing individuals to communicate their wants, needs, and ideas (Light et al., 2019).

AAC devices are essential to supporting individuals across all academic areas. I believe that AAC devices are particularly important in literacy and language classes. Research shows that using AAC devices promotes early literacy skills by supporting phonological awareness, vocabulary development, and reading comprehension through symbol-supported texts and interactive language modeling (Carnett et al., 2023); Light et al., 2019). For example, students can participate in shared reading activities where symbols represent key words. This helps students connect the visual symbols with the printed words (O'Neill et al., 2018). AAC devices also help support writing and composition skills. For example, students can construct sentences using the symbols on the software or word prediction. This allows students to practice spelling and grammar (Light et al., 2019).

AAC devices have changed the way individuals with communication needs interact with academic material and other people. As technology progresses, I believe that these devices will become even more advanced and essential to supporting students in and out of the classroom. I chose to research these devices because I have several students who bring an AAC device to my classroom, and I was curious to know more about them and how they can be used to enhance instruction and communication in my class. In my class, the students mainly use them to communicate needs with me and socialize with their peers. I love to see them be able to communicate with their peers positively. In my art classroom, I think AAC apps can allow students to identify art materials, describe textures or colors, and express opinions about their own or their peers' artwork. Vocabulary could also be customized on their devices to help them learn and communicate with the content. Incorporating AAC devices into the classroom not only supports student's academic growth but also promotes inclusion and self expression.

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