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ASSISTIVE TECHNOLOGY: *What Physical Educators Need to Know*

MICHAEL K. LAUGHLIN
NATHAN M. MURATA
MICHELE GONNELLI
JOHN LARRANAGA

Mr. Johnson, a high school physical education teacher, is adjusting to new challenges in his class. A new student named Samantha was placed in his inclusive third-period class, and Mr. Johnson is struggling to communicate with her. As a result of her disabilities, Samantha does not speak verbally, has difficulty controlling limb movements, and is uncomfortable in group or social settings. Mr. Johnson utilizes hand gestures and visual demonstrations to communicate, but there are moments when these strategies fall short. Just last week, Samantha tried to communicate with Mr. Johnson about difficulties she was having with a group task, but teacher and student struggled to understand each other.

During a recent individualized education program (IEP) meeting, Mr. Johnson asked team members for help. Samantha's special education teacher recommended he try incorporating her new augmentative and alternative communication (AAC) device during instruction. The tablet-based device helps Samantha communicate by touching response icons that produce a range of computer-generated verbal responses, from simple words and phrases to complex sentences. Heeding the advice, Mr. Johnson worked with Samantha to create icons (on the device) for specific use during his physical education class. The result has been overwhelmingly positive. The device is not only helping Mr. Johnson communicate more effectively with his student, but it is facilitating socially engaging conversations between Samantha and her peers.

The above true story portrays an increasingly common scenario where technological devices dramatically improve a student's physical education experience. For students with disabilities, assistive technology (AT) has provided significant benefits for some time (Alper & Raharirina, 2006). Federal mandates paved the way for pairing students with the technology-based supports needed to thrive in school. The Assistive Technology Act of 2004 defined AT devices as "any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities" (§ 3 [4]).

Designed to aid functional capabilities, AT devices support students as they strive toward improved "learning, independence, self-esteem, and quality of life" (Reed, 2007, p. 1). For instance, talking heart-rate monitors benefit students with visual impairments when physical educators apply the AT component of the expanded

Michael K. Laughlin (laughlin1@wpunj.edu) is an assistant professor, and Michele Gonnelli and John Larranaga are undergraduate students, in the Department of Kinesiology at William Paterson University in Wayne, NJ. Nathan M. Murata is a professor in the Department of Kinesiology and Rehabilitation Science at the University of Hawai'i at Mānoa in Honolulu, HI.

core curriculum (ECC) — a framework that encourages device instruction across social, recreational and post-secondary endeavors (Haegele, Lieberman, Columna, & Runyan, 2014). Further, many of the AT devices found in typical classroom settings also aid functional capacity to learn in physical education environments. In the case of Mr. Johnson, the use of an AAC device afforded Samantha equal opportunity to communicate and learn independently and socially, just like her peers.

Consequently, the Individuals with Disabilities Education Improvement Act (IDEA) of 2004 stated that AT includes *services* where knowledgeable and/or trained professionals assist students with disabilities to select, acquire and use a device. To this end, school-related AT devices and services operate as a process, guided by IEP team decision-making, designed to support equal access to learning for students with disabilities. Physical educators should understand that AT is more than just a piece of equipment. The latest and greatest piece of technology may exist, but it is otherwise useless if students lack the interest, ability, awareness and training to use it.

In a similar vein, physical educators need to understand how these devices operate within the context of standards-based physical education and what to do when AT decisions require adjustments. There is a critical need to understand and appreciate the role that AT plays in promoting learning to the greatest extent possible. This article aims to equip physical educators with a working knowledge of the AT process while highlighting some of the devices and services currently utilized in physical education settings. Also provided are recommendations that physical educators

should consider to ensure that students with disabilities will maximize their learning potential with AT augmentation.

Defining the Assistive Technology Process

The federally defined AT devices and services available to students with disabilities exist as a process designed to achieve a desired outcome. From beginning to end, the AT process follows a systematic progression of comprehensive steps to ensure that students with disabilities receive the devices and services necessary for their educational achievement. The successful AT process relies on a cohesive IEP team where all members do their part to support the students' AT needs. The physical educator supports this process by first having a comprehensive knowledge of the available devices and services (Lytle, Lavay, & Rizzo, 2010) in order to identify and communicate the learning benefits of AT to the students' IEP team (Tripp & Zhu, 2005).

Supporting the AT process and needs of students with disabilities may come with challenges. Dell, Newton and Petroff (2008) noted the digital divide and how student/family cultural perceptions can affect the acceptance and availability of AT. Socioeconomic hurdles leave some schools without the financial resources to fund information technology and subsequent AT devices and services, resulting in a digital separation from more affluent schools and districts. Some students and their families may also embody a culture that deemphasizes technology use and independent functioning, thus reducing the value and importance of AT for those with disabilities. Further, these authors point to a glar-



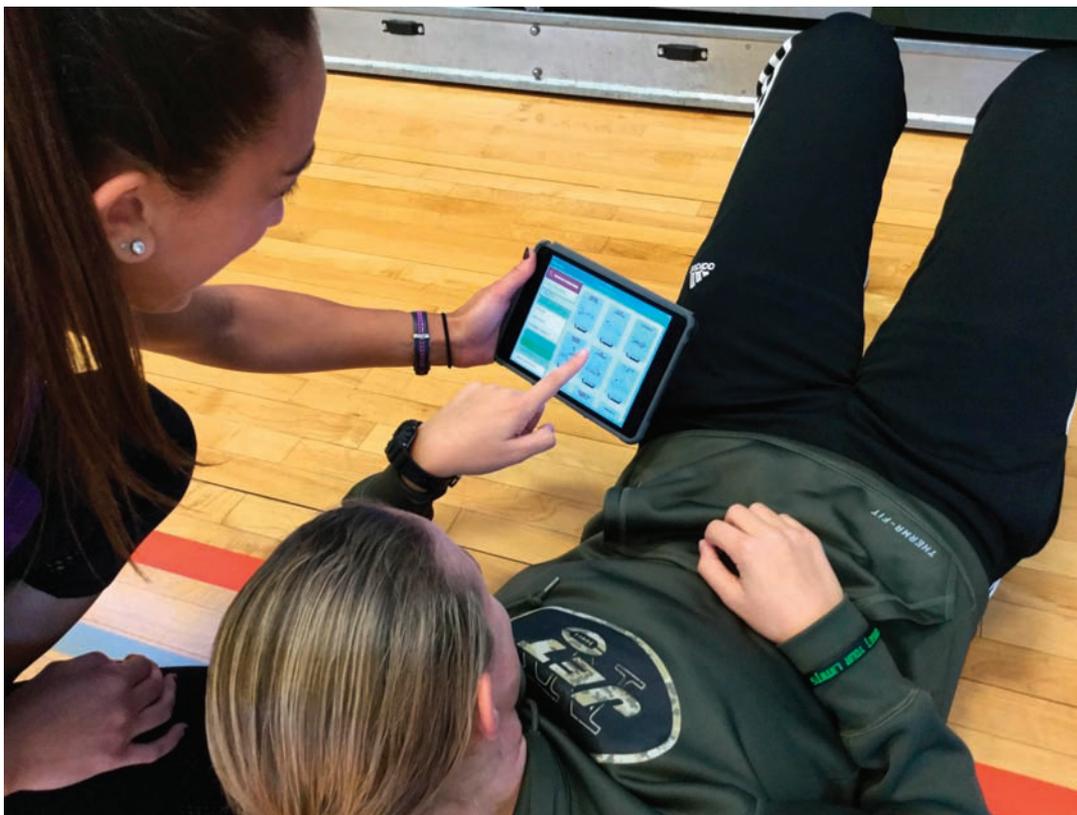


Figure 2.
Teacher using the ExerciseBuddy app to help a student select and pace fitness activities

Also shown in Figure 1, Proloquo2Go represents a more high-tech, app-based solution that is gaining notoriety for its mobility, comprehensiveness and affordability compared to older, more costly communication devices (Roth, 2013). Mobile devices as small as an iPod Touch loaded with this software app can be customized to support the unique academic language demands found within physical activity-related environments (Columna et al., 2014). For example, this device could be used with a third-grade, nonverbal student with multiple disabilities tasked with verbally reflecting on reasons why physical activity is enjoyable (Grade 3, S5.E3).

Fitness. ExerciseBuddy is one type of high-tech AT device designed to promote personal fitness (see Figure 2). Originally designed for students with autism, the Apple-based app offers structure and clarity to the learning environment, allowing students to set personal goals and organize performance across topics such as yoga, aerobics, motor coordination, and cardiovascular fitness (Grade 8, S3.M4). Adaptive controllers, modified to operate video-game systems (i.e., Nintendo's Wii Fit), exist as AT for students with physical impairments, making it possible to integrate gaming technology into their fitness portfolio (Level 2, S3.H11).

Developmental Motor Skills. Occasionally, physical educators will need to create unique AT devices to fit the needs of their students. When teaching the skill of striking to a large, inclusive physical education class, teachers must consider issues of safety and student ability, all while finding ways to maximize time on task (Grade 2, S1.E25). Creating 20–30 individual striking spots

may be ideal but raises issues of space and equipment availability. Further, traditional batting tees are designed to balance smaller balls, creating an additional challenge for some students with disabilities. A more creative approach includes structuring the learning activity into stations with one modifiable striking station positioned in a safe location as shown in Figure 3. Speed ropes can be lengthened or shortened, while balls of varying sizes, colors, and noise-making ability are easily exchanged. For students with visual impairments, a beeping baseball or bell-filled Wiffle ball can make all the difference without affecting the performance of peers without disabilities (Lieberman, Haibach, & Wagner, 2014).

Sport, Recreation and Leisure. There are a host of AT devices designed to promote functional capability across sport, recreational and leisure pursuits. The Rio 2016 Paralympics, for instance, featured several sporting events (which could be enjoyed competitively or recreationally by athletes with disabilities) where AT devices were used to support athlete performance. Examples include a mouth tab for one-arm or mechanical release in archery, straps used to stabilize the body into a wheelchair or weight-lifting bench, and noise-making balls during goalball and five-a-side soccer.

Shown in Figure 4, the SportimeMax hands-on basketball is a sport-related device favored by physical educators that provides students with a visual guide for where hands should be placed when shooting or passing the ball (Grade 4, S1.E15). To the student with learning limitations (e.g., emotional-behavioral disorders, intellectual disability), this visual reminder provides a consistent yet subtle

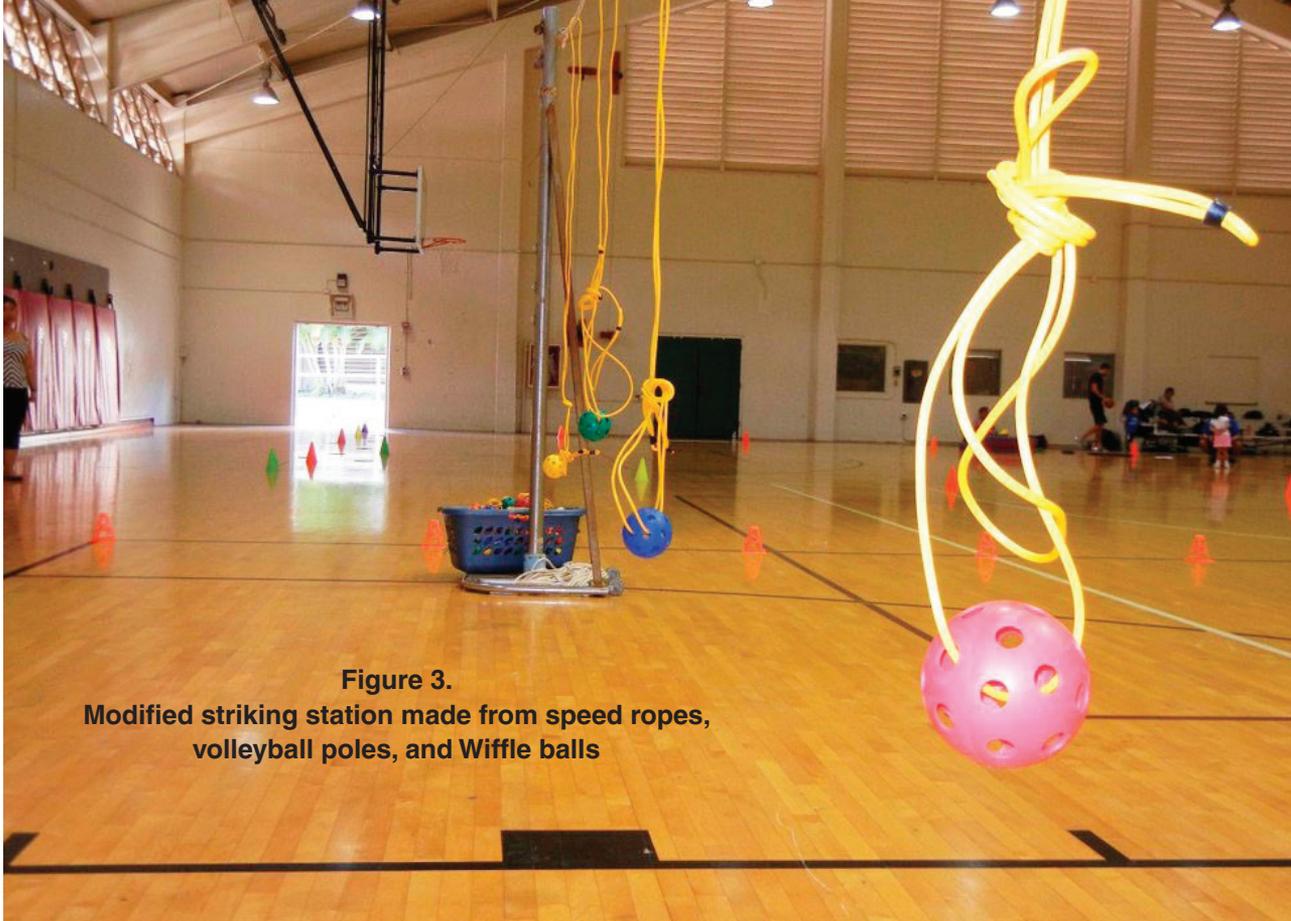


Figure 3.
Modified striking station made from speed ropes,
volleyball poles, and Wiffle balls



Figure 4.
Teacher using the SportimeMax hands-on
basketball as a visual guide for hand
placement during shooting.

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prompt, allowing the student to process basketball skills at their own pace.

Extending recreation and leisure outcomes, inclusive middle-school physical educators may prescribe a badminton unit as a means to address multiple standards, particularly engagement in lifetime physical activity (Grade 6-8, S3.M5). Lighter and larger racquets, lowered nets, and enlarged birdies or balloons operate as AT devices (see Figure 5). Other teachers working with a more specific high school adapted physical education class might address the functional needs of students with low-incidence disability by developing skill sets needed to fish independently (Level 1, S3.H6). Here, plastic or PVC piping helps stabilize fishing poles to the ground, boat or wheelchair. In both examples teachers should utilize AT devices to promote successful student participation and learning.

How to Implement Assistive Technology Services in Physical Education

As part of the systematic process, AT services extend support by helping students obtain the device, provide necessary customizations and training, and determine to what extent the device will be used within and outside of school (i.e., home, workplace, after-school sports and activities). The IDEA-specified services must include (1) evaluating student needs, (2) purchasing or acquiring devices, (3) customizing services for individual students, (4) coordinating their use with other therapies, (5) training the student, (6) and training the professionals and teachers (118 STAT. 2652, Sec. 602 definitions). These services are to remain available to the student and IEP team for as long as the student qualifies for special education services. To aid in implementation, the Quality Indicators for Assistive Technology (QIAT) were created to optimize development and delivery across the eight specific AT service areas shown in Table 1 (QIAT Community, 2012). This section details the steps that IEP teams must take to ensure that AT services are implemented correctly.

Evaluating Student Needs. The first federally mandated step considers recommendations from IEP team members and applies a trial-and-error approach where the team “tries out” different devices while measuring and evaluating their effectiveness for the student (Bausch & Hasselbring, 2004; IDEA, 2004). Equally, the first QIAT (Consideration of AT Needs) guides IEP teams with a



Figure 5.
Equipment variations for a badminton unit

matrix of seven specific indicators of how well the team considers or evaluates the AT needs of the student (QIAT Community, 2012). Did the team analyze information about the student’s educational goals and objectives? Did they explore a range of devices that address identified needs? These are two of the seven specific indicators designed by the QIAT Community (2012) to help IEP

Table 1.
Quality Indicators for Assistive Technology (QIAT)

Quality Indicator	Purpose
Consideration of AT needs	Ensure that AT is considered during IEP development and throughout the educational process.
Assessment of AT needs	Ensure that this part of the process is conducted by the team, particularly when the student’s specific needs and issues go beyond simple problem solving.
Including AT in the IEP	Ensure that the IEP team clearly documents the role that AT will play in the student’s educational programming.
AT implementation	Ensure the student’s IEP-driven AT process is incorporated into the education program in ways that allow for active student engagement and development.
Evaluation of the effectiveness of AT	Direct the process of reviewing student performance throughout the AT process and whether modifications or adjustments should be implemented.
AT transition	Ensure that transitional planning for the AT process is considered for the student’s transition across settings.
Administrative support of AT services	Define and promote necessary administrative supports (e.g., policies, procedures) needed to ensure and improve quality AT process delivery.
Professional development and training in AT	Ensure professional development and training follows a comprehensive plan and is appropriately offered to all IEP team members.

Note: Adapted from QIAT Community (2012). © QIAT Leadership Team. Adapted by permission of QIAT Leadership Team. Permission to reuse must be obtained from the original rightsholder. For more information about QIAT, visit <http://www.qiat.org>.

teams effectively evaluate student needs (refer to Table 1 for more on the QIAT quality indicators).

In the case of Samantha, the team decided that a printed PECS communication system, while cost-efficient and effective, may not satisfy all of her IEP-driven learning and social outcomes. This is when the team instead explored a more sophisticated and socially appropriate AAC device that supports more complex and realistic communication. Further, the team recognized Mr. Johnson’s input by considering device use throughout Samantha’s educational needs (including physical education class). By trying out alternative solutions that worked for the student, the team avoided common evaluation errors such as not basing decisions on IEP goals and information about the student or learning environment (QIAT Community, 2012). Once the team came to a consensus, plans were made for acquiring the device.

Purchasing or Acquiring Devices. Next, the IEP team moved to find, borrow or purchase the device. Teams will often seek to borrow devices before making unsustainable purchases. For Samantha, a loaner tablet loaded with Proloquo2Go was initially used before special education funding provided her with a device of her own. Larger school districts may have a pool of “loaner” devices, while smaller districts could rely on community lending libraries (Reed, 2007). For instance, the Association of Assistive Technology Act Programs (www.ataporg.org) coordinates resource centers in every state and territory where free to low-cost device loans are a primary initiative. Once purchase is confirmed, responsibility of payment should be established with respect to federal and state guidelines.

Customizations, Coordination with Other Therapies, and Training. Following purchase, the team must apply customizations, coordinate with existing related services, and provide training, as needed, to ensure that AT devices meet student needs (Bausch & Hasselbring, 2004). Customization involves modifying and adapting devices or their functionality to ensure the greatest ease of use for students. Mechanical switches, which allow those with limited strength and movement to operate electronic devices, could be mounted conveniently to a student’s wheelchair. Mobile AAC devices could be preprogrammed with physical education-related academic language (Columna et al., 2014). Customization for Samantha included a plastic shield for the tablet, perforated with holes to counterbalance uncontrollable hand movements, providing the necessary stability to tap only desired icons.

At the same time, device use should be fully integrated throughout all IEP-driven services (i.e., physical therapy, speech pathology, paraprofessionals), interventions, and plans used by the student. A common error during AT implementation is when IEP teams assume everyone is fully aware of what needs to occur (QIAT Community, 2012). A student’s need for AT does not stop once direct services have concluded (e.g., physical education or math class). Samantha’s physical therapist needs to be fully included throughout the AT process to ensure all aspects of the IEP are considered during implementation.

Appropriate levels of training must also extend to students, families, teachers and staff. The QIAT Community (2012) reiterated, “Training and technical assistance include any topic pertinent to the selection, acquisition, or use of assistive technology or any other aspect of assistive technology service delivery” (p. 14). Thus, physical educators are equally entitled to receive AT training if appropriate and necessary to meet the learning needs of the student. If Mr. Johnson has no experience with Proloquo2Go, training and assistance should be provided. Depending on the level of techno-

logical sophistication, the IEP team may hire outside consultants or technicians with specific knowledge for customization, coordination and training needs (Reed, 2007).

Recommendations

It is recommended that physical educators take the time to build relationships with fellow IEP team members (Columna et al., 2014). Doing so will help expose physical educators to the world of school-based AT while gaining deeper insight into the capabilities and needs of their students with disabilities. A significant source of AT knowledge stems from the student’s IEP team. Parents and family members likely possess the most experience assisting with and using AT devices across settings beyond the school day. Their insight will undoubtedly help determine and customize AT so it suits student needs. Despite signs of limited training, special education and classroom teachers, nurses, therapists, paraprofessionals, and teachers of the visually impaired are just some of the practitioners that physical educators can turn to for help (Reed, 2007).

Physical educators should make time to explore the vast collection of available resources. The AT process is well researched (Alper & Raharinirina, 2006), yielding scores of articles, textbooks, device catalogs, and online resources. For example, the American Printing House for the Blind (www.aph.org) offers a substantial list of AT for use in physical education with students with visual impairments. For help exploring the world of AT and specific devices featured in this article, Table 2 highlights some of the tools mentioned and where to find additional information online. Attending professional development opportunities also increases AT

Table 2.
**Assistive Technology Devices
and Resources**

Featured Devices	More Information
Writing tools	goo.gl/VbTqSX
Picture exchange communication system	www.pecsusa.com
Proloquo2Go	www.assistiveware.com
Wheelchairs	www.1800wheelchair.com
Switches	goo.gl/vH9NT0
Magnifiers	goo.gl/lt0qBG
Ringling balls	goo.gl/GZhrHT
Beep baseball	http://www.nbba.org/
Adaptive keyboards	goo.gl/15UXzY
Bowling ramp	goo.gl/N0UfBH
Adaptive controllers	goo.gl/PF7ntv
ExerciseBuddy	www.exercisebuddy.com
Self-made AT	goo.gl/AF1PX0
Paralympic sport AT	goo.gl/OE5LQn
SportimeMax hands-on basketball	www.schoolspecialty.com
Adaptive fishing	goo.gl/Cgxc5q

awareness. State- or district-level workshops, conferences, expos (www.abilities.com), and community-based open houses or events are all avenues for increasing AT knowledge.

Physical educators may discover that some AT devices are not conceived to operate in physical activity–related learning environments. Limited AT training and exposure during physical education teacher education could play a central role in this phenomenon, as it has in other subject areas (Dell et al., 2008; Judge & Simms, 2009). As witnessed with Mr. Johnson, physical educators play an active role in extending the selection, location and use of AT in physical activity environments. Teachers should feel empowered to communicate their observations and recommendations of how AT is used in their class to help students achieve learning outcomes.

Finally, physical education teachers should actively advocate for their students with disabilities. Unlike any other member of an IEP team, the physical educator possesses an acute understanding of the psychomotor, cognitive and affective learning demands of school-age students. This wealth of knowledge serves as an invaluable resource for any IEP team. Further, physical educators should consider resources governing the AT process as a tool of support for their advocacy efforts. For example, a student with autism may have well-defined cardiovascular-fitness learning outcomes articulated in the IEP goals and objectives. Software programs such as ExerciseBuddy with video-modeling capabilities could provide the critical functionality this student needs to develop efficient fitness-related motor skills, patterns and behaviors. Yet, IEP teams could be unaware or unwilling to consider physical education–specific devices for the AT process (QIAT Community, 2012). Federal mandates (AT Act, 2004; IDEA, 2004) and implementation resources such as the ECC (Haegele et al., 2014), QIAT (QIAT Community, 2012), and SETT Framework (Zabala, 2005) are in place to guide the AT process across all education settings so that these and other devices are considered. Physical educators who actively advocate for appropriate AT device considerations reduce the likelihood of cultural, funding and lack-of-knowledge obstacles.

Conclusion

The AT process may entail a complex series of actions, but this should not overshadow the potential value for students with disabilities. Services exist to ensure that students are thoroughly supported during the selection, acquisition and use of needed devices. In physical education, devices are being used by students to increase their functional capacity to access and achieve learning outcomes. Known obstacles may slow or derail the AT process, but thanks to federal distinction, the AT process is rightfully determined by those with the most knowledge of an individual students' needs — the IEP team. This is why physical educators are recommended to work closely with all IEP team members so that AT decisions embody practical, useful and individually chosen functionality across each student's educational learning outcomes.

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