# SUCCESSFUL IMPLEMENTATION OF ASSISTIVE TECHNOLOGY TO PROMOTE ACCESS TO CURRICULUM AND INSTRUCTION FOR STUDENTS WITH PHYSICAL DISABILITIES

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## ABSTRACT

Students with physical disabilities often require assistive technology to access curriculum and instruction. This paper discusses some of the issues that impede successful implementation of assistive technology for students with physical disabilities and provides a checklist that teachers and related services personnel may use when considering assistive technology for curriculum access. While not exhaustive, the checklist contains assistive technology services and needs that should be addressed as well as assistive technology devices that may be used by students with physical disabilities for curriculum access.

**Key words:** physical disabilities, assistive technology, curriculum and instruction

## SUCCESSFUL IMPLEMENTATION OF ASSISTIVE TECHNOLOGY TO PROMOTE ACCESS TO CURRICULUM AND INSTRUCTION FOR STUDENTS WITH PHYSICAL DISABILITIES

Although the Individuals with Disabilities Education Improvement Act (IDEA, 2004) category of Orthopedic Impairments (OI) is one of the lowest

incidence disability categories, students served through this category represent individuals with a wide array of capabilities and limitations. The physical disabilities that "orthopedic impairments" encompasses may be orthopedic in nature (e.g., arthrogryposis), may result from degenerative conditions that impact motor abilities (e.g., muscular dystrophy) or may be a result of neurological damage (e.g., cerebral palsy) (Heller, 2009). Often, students physical disabilities require curricular adaptations due to their physical limitations, concomitant disabilities (e.g., visual impairment), or functional impact of the disability (e.g., fatigue, limited communication ability)(Heller, 2009). One adaptation that can provide access to curriculum for students with these disabilities is assistive technology. As schools move toward more inclusive models and toward standards-based instruction to meet the requirements of IDEA and No Child Left Behind, students with physical disabilities may rely on adaptations and assistive technology more than ever.

Assistive technology may be an important component of K-12 education for any student with a disability, but often proves more important for students with physical disabilities. As students with physical disabilities move into adulthood, they may have a higher reliance on assistive technology than students with learning or cognitive disabilities to function more independently in home and community settings. Stumbo, Martin, and Hedrick (2009) found, for individuals with physical disabilities, that "appropriately chosen and implemented assistive technology" (p.108) is crucial for increasing the level of participation in education, employment, and independent living to levels similar to peers without disabilities. In order to increase independence and improve postsecondary outcomes for students with physical disabilities, assistive technology solutions must be fully explored during the students' school years.

The purpose of this article is to discuss issues and ideas surrounding the use of assistive technology for curriculum access for students with physical disabilities. First, an overview of assistive technology (AT) is provided for context. This is followed by a discussion of the issues that impact the successful use of assistive technology for students with physical disabilities. Finally, a checklist is provided that can be used by assistive technology teams when considering assistive technology services, needs, and devices for curriculum access by students with physical disabilities.

**Overview of Assistive Technology for Students with Physical Disabilities**

The Individuals with Disabilities Education Improvement Act defines an assistive technology (AT) device as, ". . . any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or

customized, that is used to increase, maintain, or improve the functional capabilities of a child with a disability." [20 U.S.C. § 1401 (1); 1401(2)]. Simply stated, AT can be anything that helps a student with a disability perform a task that he or she otherwise would not be able to perform or to increase the efficiency with which the task is performed. Even simple, everyday items can be AT. For example, when a student who only has use of one hand uses a piece of scotch tape to hold a piece of paper while writing, the tape becomes AT. For students with physical disabilities, AT devices may include those which increase physical access as well as items which increase the capacity for communication or performance of academic tasks. Such devices range from low technology, which includes non-electronic items such as pencil grips or paper communication boards, to middle technology including battery operated devices such as calculators or hand-held spellcheckers, to high technology, which includes items which are electronic or mechanical in nature such as computers with assistive software.

IDEA also requires schools to provide assistive technology services. These services include any task performed by school personnel which assists a child with a disability with selection, acquisition, or use of an AT device. IDEA mandates that AT must be considered for every student who has an individualized education program; however, it does not stipulate how these services must be provided. Thus, assistive technology services range greatly from state to state and even from school district to school district (Bausch, Ault, Evmenova, & Behrmann, 2009). In an ideal situation, the school system would have a team of AT specialists that assists with assessment, procurement, training, and implementation of the use of AT devices. However, many systems where hundreds of students receive special education services have only one or two AT specialists and some personnel may have a primary role (e.g., speech-language pathologist, occupational therapist) in addition to serving as the system's AT specialist. Therefore, it is imperative that teachers of students with physical disabilities are knowledgeable about AT and how to implement AT in a way that best meets the needs of their students.

Research shows that there is a high rate of abandonment and under use of assistive technology devices (Bryant & Bryant, 2003; Johnston & Evans, 2005; Riemer-Reiss & Wacker, 2000; Verza, Carvalho, Battaglia, & Uccelli, 2006). Anecdotally, this author has seen AT devices sitting on shelves or stored in cabinets and has heard numerous reports from teachers and student teachers of devices that go unused or underused. Recently, the author was at a school to work with a student teacher who requested assistance with a student who has severe physical disabilities and complex communication needs. When the author picked up the student's augmentative communication device, there was a thick layer of dust covering the screen. This particular

device, like many that are underused or abandoned, cost several thousand dollars. This is one example that demonstrates how underutilization and/or abandonment results in wasted financial resources. This is consistent with research in which findings demonstrate high percentages of abandonment of assistive technology devices (Johnston & Evans, 2005; Riemer-Reiss & Wacker, 2000). More importantly, underuse of an AT device robs the student of meeting maximum potential for performing the task for which the device was acquired. AT devices, by definition, are intended to increase, improve, or maintain an individual's functional capabilities. When devices are underused or abandoned, students are left performing tasks less efficiently or less independently than the potential performance afforded by device use (Coleman & Heller, 2009). There are several issues that may impact the successful use of assistive technology by students who have physical disabilities. Several of these issues that will be discussed are assessment; training; timeliness and consistency of implementation; psychosocial, cultural and environmental factors; and motivation and effort which impact the use of assistive technology.

## Issues And Possible Solutions for The Successful use of Assistive Technology

**Assessment.** One reason that AT devices are underused or abandoned is the lack of fit between the AT user and the features of the device (Bryant & Bryant, 2003; Coleman & Heller, 2009; Riemer-Reiss & Wacker, 2000). Approximately one third of AT devices are abandoned within the first year because the assessment process was not thorough enough to ensure that the device purchased would match the needs of the user (Bryant & Bryant, 2003). In a survey regarding assistive technology service provision, Bausch et al. (2009) found that only .5% of respondents said evaluation of AT was a service their students with disabilities received. They stated, "Such a low number may be attributed to the fact that almost all students considered for this survey used some kind of AT at the time the data were collected. However, evaluation of a student's needs and evaluation of the effectiveness of a chosen device or program should be an ongoing process in order for technology implementation to be successful" (p.13).

Ideally, AT assessment is performed by a team of individuals that includes an AT specialist as well as teachers, related services personnel (e.g., physical and occupational therapists), parents and other members of the child's IEP team. Often, the team will start with a framework, such as the SETT Framework (Bowser & Zabala, 2005), to engage in preplanning and determining the responsibilities of team members and plan for the assessment

process. A framework provides a way to look at all factors that may impact the student's success with an AT device. For example, Hemmingsson, Lidström and Nygård (2009) found that environmental factors, such as lack of accessibility and teachers' attitudes factored in to whether students did or did not use their AT devices. With a framework, these factors are explored at the beginning stages of considering whether or not the student needs AT and are used as part of the decision-making process. The team should then proceed through a comprehensive assessment process.

There are several commercially available AT assessment instruments (e.g., Lifespace Access Profile) as well as assessment protocols that are available from AT organizations (e.g., Georgia Project for Assistive Technology). Whatever assessment tools are used, it is imperative that the team consider the specific needs of the individual (motor abilities, preferences, motivation), the environments in which the device will be used (classroom arrangement, availability of electrical outlets, personnel who will be involved in programming or training use of the device, attitudes and expectations of individuals in each setting), and the features of the device (size, portability, durability). Thorough, upfront planning and assessment may lead to higher success rates of the use of AT devices by students with physical disabilities.

**Training.** Lack of training is often cited as a reason for abandonment of AT devices (Bryant & Bryant, 2003; Coleman & Heller, 2009; Parette, VanBiervliet, & Hourcade, 2000; Riemer-Reiss & Wacker, 2000; Verza, Carvalho, Battaglia, & Uccelli, 2006; Wilcox, Guimond, Campbell, & Moore, 2006). Bausch et al. (2009) found training to be the most frequently reported AT service; however, training was only reported by 24.3% of respondents. Of these responses, student training encompassed 13.4%, training and technical assistance of professionals constituted 3.5%, and parent training was reported at .7%, with a remaining 6.7% of training unspecified. When considering the implication that many AT devices are underutilized or abandoned due to lack of training, it is unacceptable that more than 75% of students using AT receive no training for themselves, their teachers, or their families. It is imperative that teachers of students with physical disabilities, and related services personnel who work with these students, make time to receive training in assistive technology so they know (a) what devices are available commercially or know how to create low-tech devices to meet individual student needs, (b) how to operate and implement AT devices in their classrooms, (c) how to teach their students to use AT devices and follow up with ongoing data collection to ensure the devices are effectively meeting their students' needs, and (d) where to locate additional resources and receive additional training.

University courses and training programs offered by assistive technology organizations are a good place to receive training. Online courses are available which may provide a wealth of information even though hands-on time with AT devices will be limited in this format. For training on a specific device, teachers and related services personnel should seek assistance from the AT specialist in their school system or through the device's vendor. Many companies will provide training on a device to school personnel. Sometimes this is free; however, if there is a cost associated with training that is not available within the system, training by an outside agency or vendor should be covered by the school if it is included as an AT service in a student's IEP. If possible, the student's family should be included in training so that the device can be used effectively at home. If all other options are exhausted, teachers and/or related services personnel may have to self-train by reading the device's manual and "playing with" the device. Even though this may seem intimidating, self-training may prove to be the method that results in the most thorough acquisition of skill with the device as compared to other forms of training.

After the school staff and family are trained in the use of an AT device, it is imperative that students receive thorough training on device use. This is true even for devices that seem simple and self-explanatory. There always needs to be some form of training about the rationale for use of the device (e.g., "This pencil grip will help you position your fingers correctly") and how to use, care, and maintain the device to the greatest extent possible (Coleman & Heller, 2009). Thorough training for all people who will work with the device is critical to the successful use of AT by students with physical disabilities.

**Timely and consistent implementation of AT devices.** The timing during which assistive technology is introduced and the consistency with which assistive technology is implemented can impact whether a student with a physical disability is able to successfully use AT to access standards-based curriculum. There are several issues which relate to the timeliness of device implementation including whether device training occurs during academic instruction, whether devices that may promote access to academic tasks should be introduced to very young children or children approaching the end of their school careers, and the regularity with which assistive technology is used.

Often, school-aged students with physical disabilities are trying to learn AT device use along with the academic content (Coleman & Heller, 2009). For example, a student who has trouble writing by hand may be learning to type at the same time he is learning sentence structure. This places additional cognitive and physical demands on learning each skill. It is more efficient to train the student on the device prior to using it to complete academic tasks.

However, the use of a new device does not have to be "all or nothing." One solution is having the student complete a small portion of the task with the device and then allow completion of the task in another way until proficiency is increased with device use. This will provide practice with the device while limiting fatigue and allowing the student to focus on the academic task. During the process of device implementation, it is important that the student's teachers recognize that performance of the academic task may not represent the student's best work when there are additional demands of learning the device.

The timeliness of device implementation is another factor for consideration. The benefits of early intervention for children with physical disabilities is extensively assumed and discussed in the special education literature (Ziviani, Darlington, Feeney, & Head, 2011). It is widely accepted that implementation of interventions should occur at the earliest possible age to increase the capabilities of children and decrease the need for more restrictive special education services upon entering elementary school. Nonetheless, research shows that assistive technology often is not considered or is underused with young children who have disabilities and the numbers of children with disabilities birth through age three who have AT devices and services listed in their Individualized Family Service Plans is consistently low (Wilcox, Guimond, Campbell, & Moore, 2006).

For children with physical disabilities who face barriers to and have delays in the acquisition of academic, communication, and social skills, it is particularly important that AT devices for these tasks be implemented as early as possible. Campbell, Milbourne, Dugan, and Wilcox (2006) analyzed the body of literature on AT use for infants and young children with their primary population being children with physical or multiple disabilities. The authors found that switch use, computer use, and mobility devices were commonly targeted; however, most were not examined in functional contexts. Of the 23 studies they examined, only one study addressed augmentative and alternative communication (AAC) and this was the only study in which a functional skill within typical activities and routines was taught. Østensjø, Carlberg, and Vøllestad (2005) examined assistive technology use with a selection of children with physical disabilities aged two to seven and a half years. They found that mobility devices and devices that aided with caregiving demands (e.g., feeding, toileting) were used most frequently for students with more severe physical limitations. Devices that were used infrequently or inconsistently were those that promoted communication, social, preacademic, and play skills.

There is a definite need for more research on a wider array of assistive technologies for young children with physical disabilities. Switch use is important for this population as it may lead to enhanced computer access and mobility, and self-care assistive devices are important to enhance independence. However, the lack of studies in which assistive technology is used to enhance skills that

contribute to curriculum access (e.g., communication, preacademic, socialization, etc.) for young children with physical disabilities suggests that AT is underused with this population of students. Implementing AT to assist with a wider array of skills beyond self-care and mobility with young children who have physical disabilities is crucial in order to build their fluency with devices prior to the time when they will rely on AT to access instructional activities and curriculum. Having said that early implementation is critical, it is important that older students are not precluded from being introduced to new technologies.

In general, there is little research about the use of assistive technology for older students with physical disabilities. Articles discussing time of implementation were not located during several literature searches. This author worked with students who received assistive technology during elementary, middle or high school and found that successful use of AT is possible at all ages. She encountered situations in which AT was not recommended because a student was approaching the last few years of school. Given that AT may open tremendous opportunities for employment or adult community interactions, it appears that withholding the opportunity to be considered for AT has severely negative consequences. One young man with whom the author worked was 16 years old when he was introduced to a head-controlled mouse emulator (i.e., a device which allows head movements to control the mouse cursor). Because of severe cerebral palsy with asymmetric tonic neck reflex and concomitant learning difficulties, he had never been able to successfully access a computer prior to this time. With the use of this device, he was now able to increase independence in accessing the internet, using the computer for leisure skills (e.g., solitaire, music applications), and building prevocational skills (e.g., using an onscreen keyboard to complete personal information on a job application). Common logic suggests that earlier is better; however, teachers of students with physical disabilities should stay abreast of new technology options that may have a profound impact on students of all ages.

Another issue regarding the timeliness of implementing AT is transition. Unfortunately, AT often does not follow a student from school to school even within the same school system. Some systems purchase AT for classrooms rather than for individual students. This has advantages in that teachers can count on having those pieces of AT from year to year; however, the disadvantage is that a student who has become proficient with a certain device or piece of software may not have that available in the next environment. Of course, the major time when a student will lose AT is the transition from school to post-school environment (e.g., college, employment). Once a student is proficient with the use of a device, it may be detrimental to take away access to it or to expect learning a new device because of unavailability in the next environment. Teachers and related services personnel who work with students who

have physical disabilities must know which technologies are available in their students' next environments (e.g., preschool teachers about kindergarten, fifth grade teachers about middle school, etc.) and plan for the transition at least a year ahead of time. This may include coordinating with the assistive technology specialist and teacher in the next setting or with vocational rehabilitation or other community organization if the student is of high school age.

Finally, it is important for AT to be implemented consistently. For K-12 students with physical disabilities, significant delays in acquiring assistive technology and lack of follow-up are not uncommon. Edyburn (2004) states that ". . . the assistive technology referral and evaluation system is subject to the same inherent limitations of the special education referral and evaluation system: inefficiency, significant delay in the provision of intervention services, high cost, and inadequate emphasis on follow-up after the initial evaluation" (p. 18). Often, teachers and related services personnel have no control over how quickly the school system moves to provide AT devices for students. Therefore, it is imperative that these professionals know about local resources for assistive technology, different types of devices, and ways to implement or create low tech devices that can be used in the interim while they are waiting for formal evaluation and acquisition of higher or more expensive technologies.

According to Edyburn's (2004) statement above, follow-up after initial evaluation is often inadequate. This includes training as described previously, but also includes consistent implementation of AT devices. Edyburn laments the lack of knowledge regarding AT outcomes in special education. This holds true for AT use by individuals with physical disabilities. No studies describing methods for consistent implementation, data collection of device use, or follow-up support for AT use by students with physical disabilities were found during literature searches. Not only does this cry out for more research, but there is a large implication for the need for such support in the implementation of AT devices and services. Teachers and related services personnel who work with students who have physical disabilities should be knowledgeable about data collection procedures so they can document the efficiency and effectiveness of an AT device with regard to increasing a student's functional capabilities. School systems should have support services in place to provide follow-up services to support teachers whose students are using AT. If AT is not used consistently, it is more likely to be abandoned completely because the user will not become proficient in its use.

**Psychosocial, cultural, and environmental factors.** Numerous psychosocial, cultural, and environmental factors may impact whether or not a student with a physical disability successfully uses assistive technology. Pape,

Kim, and Weiner (2002) analyzed 81 studies to examine how individuals with physical disabilities individualize meanings of AT based on personal factors and how these meanings shape their use or non-use of AT devices. Overall, they found that psychosocial factors (e.g., adaptation factors such as acceptance of disability and coping strategies) and socio-cultural factors (e.g., gender, stigma, and racial and ethnic group membership) played a large role in how an individual personally defines assistive technology which, in turn, impacts use of the device. Additionally, the type of disability may play a role in the how an individual defines AT. Scherer (2000) found that individuals with congenital disabilities (e.g., cerebral palsy) may view AT devices in a more positive light than those who have acquired disabilities (e.g., spinal cord injuries) and may view AT devices as reminders of what skills they have lost. This factor must be considered when working with students who have acquired disabilities or physical limitations resulting from progressive disorders.

It can be a source of frustration when teachers know that an AT device can open doors to independence and access to curriculum for a student who is reluctant to use it. Team collaboration including the student's parents, teachers, related services personnel, paraprofessionals, and, if possible, the student is essential when psychosocial factors impact a student's AT use. It may be helpful to involve a school counselor as part of the student's AT team to help develop strategies for increasing the student's coping skills and acceptance of disability which may then increase the willingness to use AT devices.

Cultural factors may play a role in whether AT use is successful or unsuccessful for a student with a physical disability. Families from varying ethnic or cultural backgrounds may view AT devices with a different perspective from the dominant culture of a school. Families and professionals may differ in the way they value the independence a device promotes, in their views of the importance of social stigma, of not having a device call attention to a student, or in their goals and objectives for device use (Parette & Brotherson, 2004). Again, collaboration is essential for promoting successful use of an AT device. Teachers and related services personnel must work carefully with parents through all stages of assistive technology consideration to develop a plan for when and how a student will use an AT device. It is important for the school personnel to understand the family's views of AT and work within their values and beliefs to create a plan that will satisfy everyone involved with the student's use of AT. Also, it is imperative that parents receive an explanation of how the device will provide the student with access to the curriculum and why this is crucial to the student's success.

Hemmingsson et al. (2009) utilized mixed methods to explore the use or non-use of AT from the perspective of students with physical disabilities in general education settings in Sweden. They found that psychosocial aspects related to how a device impacts the student's self-image or peer interactions

played a large part in use or non-use of a device. Hemmingsson et al. state, "One of the most decisive characteristics for students was that the ATD [assistive technology device] could be used without threatening or complicating students' social participation with peers. Results revealed that even if an ATD enhanced independence in school activities, it might be rejected if peer relations were jeopardized" (p. 469). Teachers and related services personnel may need to think creatively about how to implement the use of AT devices without compromising their students' social and emotional needs.

For students with physical disabilities who are reluctant to use their devices in general education because of the impact on self-esteem or peer relationships, school personnel can increase the acceptability of device use in a number of ways. First, an attempt should be made to decrease the stigma of the device. This may be done by introducing the device to all students in the classroom and letting them explore and understand its purpose. Assigning peer helpers who are trained in the use of the device may also promote acceptance and build social relationships between peers without disabilities and the student with a physical disability. While issues of least restrictive environment must always be considered, sometimes students need to learn the use of their device in a separate environment in order to become comfortable and proficient with their use prior to using the device in the general education setting.

Additional environmental factors must be considered when evaluating AT for curriculum access. First, the attitudes of all individuals involved in the student's educational environments must be taken into account. Teachers who do not frequently work with students who have physical disabilities may not see the importance of an AT device. Explanation and training are important in increasing awareness and acceptance of the device within the school environment. Size of equipment and space allotted must be analyzed to determine the best way to make the technology fit into educational settings. Additionally, the student's AT team should consider factors such as the number and location of electrical outlets, the need for extension cords and permission to use them (check the school system's fire and hazard code), and the portability of the device between environments and personnel who will be available to help with transporting it if needed. Ideally, the psychosocial, cultural, and environmental factors should be considered in the beginning stages of the AT process; however, it is important for teachers and related services personnel to be aware that these factors may impede successful use of AT for their students with physical disabilities at any point in the implementation of an AT device.

**Motivation and effort.** One psychosocial factor mentioned in studies by Pape et al. (2002) and Hemmingsson et al. (2009) is motivation. Given the importance of motivation in successful AT use, it is discussed separately. One

explanation for lack of success of an AT device at promoting increased skill performance can be explained by Baker's Basic Ergonomic Equation:

$$\frac{\text{Motivation of AT user to pursue and complete a task}}{\text{Physical effort} + \text{Cognitive effort} + \text{Linguistic effort} + \text{Time load}} = \text{Successful or unsuccessful AT use}$$

This theory suggests that the successful use of assistive technology depends on the user's motivation to perform the task outweighing the combination of the cognitive effort, physical effort, linguistic effort, and time load needed to perform the task with the device (King, 1999). Sometimes using an AT device to perform a task requires effort that far outweighs other adaptations that the student may have been using prior to receiving the device. If there is a high level of motivation to perform the task, the student may not feel the effort required is worth the outcome achieved. For example, a student with severe cerebral palsy who receives an expanded (i.e., larger-sized) keyboard after being accustomed to dictating work to an adult may view the time and physical effort required for typing less important than the ability to complete work independently. It is the challenge of the people on the student's AT or IEP team to determine how to increase motivation while reducing the effort time load. This may be achieved in a number of ways.

First of all, it is important to explain the rationale for the use of the device to the student. In the example above, the student needs to understand what independent production of written works will mean in the future, such as the possibility of attending classes without 1:1 adult assistance or the ability to correspond privately with others via email. Motivation may also be increased through the use of reinforcement. In order to increase motivation while decreasing the physical effort and time load, reinforcement of successive approximations (i.e., shaping) may be used. As mentioned earlier, teaching the device at the same time as the skill would involve beginning with the student completing small parts of the assignment independently and then dictating the rest. After completion of the required amount of work, the student receives positive reinforcement. For some students, intrinsic motivation initially may be low for academic performance or device use; extraneous reinforcers (e.g., stickers, 5-minute free time coupon) may be necessary based on the student's preferences. The amount of independent work required to receive the reinforcer is slowly increased which allows the student to build physical tolerance and skill as well as confidence for performing the task. Once the student is successful in using the device to perform the academic skill, the extraneous reinforcers are faded.

**Summary of issues.** Assessment; training; timeliness and consistency of implementation; psychosocial, cultural and environmental factors; and motivation and effort may impact the use of assistive technology by students with physical disabilities. This certainly is not an exhaustive list of the various issues that may play a role in AT device use for students with physical disabilities. Instead, the aim is to present several of the main issues along with suggestions for teachers and related services personnel who work with students with physical disabilities.

Although addressing each issue may take additional time and effort on the part of the teachers and related service personnel who work with a student, the extra attention to these details may be the key to the student's successful use of AT to access the general education curriculum. As a field, more research is needed to guide professionals in implementing AT services and addressing all of a student's needs with regard to using AT. Given the potential AT has for increasing access to curriculum and future opportunities for a student with a physical disability, it is imperative that teachers, related services personnel, and university faculty who train teachers and related services personnel work in conjunction to ensure the best possible AT service implementation for these students during their school years. The following checklist contains a page with these issues to guide assistive technology teams in implementing assistive technology for curriculum access for students with physical disabilities. Additionally, the checklist contains possible AT devices to consider for accessing curricula. This is not meant to be a complete list, but may prove useful for teams who are considering AT for a student with a physical disability.

**Assistive Technology Checklist: Curriculum Access for Students with Physical Disabilities**

To reiterate, an assistive technology device can be any item used to increase the functional capabilities of an individual with a physical disability. The following checklist is designed to provide guidance in AT services and needs that should be addressed as well as specific AT devices that should be considered for increasing access to curriculum or instructional activities for students with physical disabilities. The first page covers the issues that were discussed earlier. Blank spaces for writing have been shortened due to space constraints. If used by a student's AT team, larger areas should be included so that each area can be addressed thoroughly. The rest of the checklist contains lists of potential AT solutions for curriculum access for students with physical disabilities.

The assistive technology devices provided in the checklist are devices that increase access to curriculum or instruction. Assistive technology for mobility

and self-care are the most frequently used technologies for students with physical disabilities (Huang, Sugden, & Beveridge, 2009; Østensjø, Carlberg, & Vøllestad, 2005); however, those devices are not included in the checklist because the focus here is on assistive technology for curriculum access. Students with physical disabilities often require devices for positioning and accessing computers; they may have concomitant communication or visual limitations which span across curriculum areas. Potential devices which may address these needs are presented on the second page of the checklist. The remaining pages present potential AT devices for specific curriculum areas: reading, writing, math, social studies, science, and fine arts. Only a few no tech solutions (i.e., adaptations that do not require a device) are included because of space constraints and availability of this information from other sources such as internet sites and textbooks. This checklist is provided as one possible tool to guide teachers and related services personnel in planning for successful use of AT to access curriculum and instruction by students with physical disabilities.

Table 1

**Assistive Technology Checklist: Curriculum Access for Students with Physical Disabilities**

Student: _____ Date: _____

Student's Diagnosis/Eligibility: _____

Student's Functional Capabilities to Perform Academics with/without Assistive Technology: _____

Student's Functional Limitations that Require Assistive Technology: _____

_____

**Complete the following checklist for assistive technology services, needs, and devices that may be beneficial for this student to access the general or adapted curriculum.**

**Assistive Technology Services / Needs to Address**

**Assessment**

- ☐ AT Framework (e.g., SETT Framework) completed. Notes: _____
- ☐ Formal assessment of AT needs (optional) completed. Notes: _____
- ☐ Trials with device(s) completed. Notes: _____

**Table 1 cont.**

**Training**

- ☐ All school personnel who will interact with the student's device have received training on device operation and programming. Personnel who are trained: _____
- ☐ All school personnel who will interact with the student's device have received training on ways to incorporate the device into the student's daily activities. Notes: _____
- ☐ Student has been trained to use the device including rationale for use and basic device maintenance. Notes: _____
- ☐ Student's family members have been trained to use the device. Notes: _____

**Implementation**

- ☐ Devices that may increase curriculum access or skills in the student's next environment have been considered: _____
- ☐ Ongoing data are being collected to ensure that the device is meeting the student's needs. Types of data/notes: _____
- ☐ Device training occurred before implementation or consideration is made for academic work completed with the device. Additional training needs: _____
- ☐ Device is being used consistently. If not, strategies for increasing use: _____

**Psychosocial, Cultural and Environmental Factors**

- ☐ Attitudes toward technology for student, family, and personnel have been considered. Strategies to address attitudes: _____
- ☐ Student's family has been included in AT process and cultural values have been considered. Notes and strategies: _____
- ☐ Attempts to reduce stigma of device have been made (e.g., peer training, peer helpers). Notes: _____
- ☐ Environmental factors such as space, electrical outlets, and portability across settings have been addressed. _____
- ☐ Student's motivation to use the device has been addressed. Reinforcers and reinforcement schedule are in place (including plan to fade reinforcement): _____
- ☐ The amount of physical, cognitive, linguistic effort and time needed to use the device has been considered. Strategies for decreasing effort and time (e.g., additional training, strength building through practice): _____

**Assistive Technology Devices for Curriculum Access**

**Across Curriculum Areas**

**Physical Support: AT for Positioning to Enhance Access to Curriculum or Participation in Classroom Activities**

- ☐ Student does not have mobility or positioning needs that require AT (skip to next section).
- ☐ Student does have mobility or positioning needs that require AT. Possible solutions:
  - ☐ Changes to position of desk or materials (e.g., higher desk, materials positioned to student's dominant side).
  - ☐ Environmental changes to accommodate mobility or positioning equipment (e.g., wider aisles for wheelchair or walker)
  - ☐ Materials placed on a slanted surface.
  - ☐ Nonslip material placed under materials for stabilization (e.g., Dycem)
  - ☐ Positioning or seating equipment used to promote stabilization during academic work (e.g., roll placed under arms, student positioned in stander or feeder seat used during reading).

**Computer Access: AT for Physical Access to the Computer**

- ☐ Student does not need AT to access a computer for academic purposes (skip to next section).
- ☐ Student does require AT to access a computer. Possible solutions:
  - ☐ Changes to position of monitor and/or keyboard (e.g., lower monitor, keyboard placed on slanted surface).
  - ☐ Accessibility features (e.g., Sticky Keys, Filter Keys, mouse cursor slowed down)
  - ☐ Low tech devices used to assist with computer access (e.g., handpointers, headpointers, mouthsticks)
  - ☐ Adaptive keyboard (e.g., smaller, larger, onscreen)
  - ☐ Hand-controlled adaptive input devices (e.g., trackballs, joysticks, trackpads)
  - ☐ Head-controlled input device (e.g., SmartNav) or eye tracking input system
  - ☐ Switches with scanning software (e.g., switch with switch interface and ScanBuddy software)

**Communication: AT for Curriculum Access or Participation in Classroom Activities**

- ☐ Student does not have communication needs that require AT (skip to next section).
- ☐ Student does have communication needs that require AT. Possible solutions (check all that apply):
  - ☐ No tech solutions such as signing or gestures.
  - ☐ Low tech communication devices (e.g., picture boards, flip books) or mid tech communication devices (e.g., BigMack, GoTalk) to provide the student with quick access to frequently used words and phrases.

**Table 1 cont.**

- ☐ High tech communication devices (e.g., Dynavox, laptop with Speaking Dynamically Pro software) to meet multiple communication needs.
- ☐ Low, middle, or high tech communication device with questions and comments for classroom participation.
- ☐ Low, middle or high tech communication device with activity-specific vocabulary and phrases.

**Vision: AT to Meet Visual Needs for Accessing Curriculum**

- ☐ Student does not have vision needs that require AT (skip to next section).
- ☐ Student does have vision needs that require AT. Possible solutions (check all that apply):
  - ☐ Text enlarged using word processing software or copier
  - ☐ Large print materials ordered from an outside source
  - ☐ Handheld magnifiers (nonelectronic or lighted)
  - ☐ Electronic magnifiers (e.g., Closed Circuit Television)
  - ☐ Computer access: Accessibility features (e.g., magnifier, larger cursor)
  - ☐ Computer access: Screen enlargement software (e.g., ZoomText)
  - ☐ Computer access: Screen reading software (e.g., JAWS)
  - ☐ Audio text on CD, MP3, or specialized device (e.g., Victor Reader)
  - ☐ Braille devices: Nonelectronic or electronic

**Specific Curriculum Areas**

**Reading: AT for Access to Reading Curriculum**

- ☐ Student does not need AT to access reading curriculum or reading activities (skip to next section).
- ☐ Student needs AT to access reading curriculum or reading activities. Possible solutions (check all that apply):
  - ☐ Low tech reading devices (e.g., page fluffers, slant boards, reading guides, Color Line Prompting Strategy)
  - ☐ Auditory access to text on handheld devices (e.g., MP3 player, Victor Reader)
  - ☐ Computerized text for physical access (e.g., PowerPoint book, My Own Bookshelf)
  - ☐ Text-to-speech software (e.g., Kurzweil 3000, Read:OutLoud)
  - ☐ Screen reading software (e.g., Read and Write Gold)

**Writing: AT for Access to Writing Curriculum**

- ☐ Student does not need AT to access writing curriculum or writing activities (skip to next section).
- ☐ Student needs AT to access writing curriculum or writing activities. Possible solutions (check all that apply):

- ☐ Low tech writing devices (e.g., pencil grips, weighted pencils, slant boards)
- ☐ Portable word processors (e.g., Alphasmart)
- ☐ Standard word processor in lieu of handwriting (e.g., Microsoft Word) including options such as abbreviation expansion (done with auto-correct feature)
- ☐ Software to access worksheets (e.g., PDF Annotator, PaperPort)
- ☐ Talking or symbol word processors to help with writing process (e.g., Write: OutLoud, Symwriter)
- ☐ Word prediction to reduce keystrokes or to improve spelling and grammar (e.g., Co: Writer)
- ☐ Graphic organizer software to increase written production (e.g., Inspiration, Draft: Builder)
- ☐ Speech-to-text software for physical access or to increase written expression (e.g., Dragon Naturally Speaking)

**Math: AT for Access to Math Curriculum**

- ☐ Student does not need AT to access math curriculum or math activities (skip to next section).
- ☐ Student needs AT to access math curriculum or math activities. Possible solutions (check all that apply):
  - ☐ Adaptive manipulatives (e.g, larger, softer, Velcroed, magnetic)
  - ☐ Onscreen manipulatives (e.g., Intellimathics)
  - ☐ Adaptive calculators (e.g., larger, talking, onscreen)
  - ☐ Low tech solutions for money (e.g., larger money, using a weighted money clip, homemade pad with separate coin areas)
  - ☐ Low tech solutions for telling time (e.g., larger practice clocks, clock hands with Sticky Tack)
  - ☐ Middle tech math devices for money or time (e.g., Coin-U-Lator, talking clocks or watches)
  - ☐ Onscreen math worksheet software (e.g., MathPad)
  - ☐ Software for typing algebraic equations (e.g., MathType)
  - ☐ Higher level math software (e.g., Algebrator, Geometer's Sketchpad)

**Social Studies and/or Science: AT for Access to Social Studies or Science Curriculum**

- ☐ Student does not need AT to access social studies or science curriculum (skip to next section).
- ☐ Student needs AT to access social studies or science curriculum. Possible solutions (check all that apply):
  - ☐ Enlarged or tactile maps and diagrams
  - ☐ Electronic graphic (e.g., Excel) or diagrams created using graphic organizer software (e.g., Inspiration)

**Table 1 cont.**

- ☐ Wheelchair accessible lab tables
- ☐ Adapted laboratory equipment (e.g., plastic instead of glass equipment, beakers with handles, test tubes with grips, darker or larger print on equipment)
- ☐ Electric stirrers
- ☐ Turkey baster to control amounts of liquid added to an experiment
- ☐ Adapted microscopes (e.g., on movable base at wheelchair height, extended eyepiece)
- ☐ Mirrors over/behind person doing experiment or cameras that project experiment onto computer screen

**Art and/or Music: AT for Access to Art or Music Curriculum**

- ☐ Student does not need AT to access art or music curriculum (skip to next section).
- ☐ Student needs AT to access art or music curriculum. Possible solutions (check all that apply):
  - ☐ Materials stabilized (e.g., clipboards, nonslip material)
  - ☐ Alternative equipment (e.g., sponges instead of brushes, chart paper instead of regular size paper)
  - ☐ Adapted art equipment (e.g., large handled paintbrushes, spring open scissors)
  - ☐ Computer paint programs (e.g., Microsoft Paint, Tux Paint)
  - ☐ Large print sheet music
  - ☐ Adapted instruments (e.g., one-handed recorders, instrument stands)
  - ☐ Switch-adapted percussion instrument (e.g., Band Jam)
  - ☐ Electronic movement-based instrument (e.g., Soundbeam)

Other Student Needs to Address or Assistive Technology Devices to Consider:

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