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Assistive Technology in Early Childhood

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Abstract

This paper focuses on assistive technology in early childhood. The paper includes information about a general overview of assistive technology, benefits of assistive technology, types of assistive technology, determination of appropriate assistive technology devices, implementation of assistive technology, and perspectives of assistive technology from caregivers and classroom teachers. Assistive technology has the ability to improve the lives of individuals with disabilities, and can even be used with young children. Assistive technology can be broken down into two categories, services and devices and these topics are explored within this paper. There are a variety of types of assistive technology devices and ways to categorize the devices for supporting the child. Assistive technology should be determined individually for each child, and this paper provides information about different tools that can be used in early childhood. Assistive technology toolkits are one effective way to implement assistive technology into early childhood to support students with disabilities and students without disabilities. Perspectives from caregivers and teachers are important to consider when implementing assistive technology in early childhood. In this paper, many articles and sources were reviewed to gain greater insight about assistive technology in early childhood.

Key words: assistive technology, early childhood, inclusion, physical health disabilities,

Overview of assistive technology

In 1988 with the passing of the Technology-Related Assistance for Individuals with Disabilities Act (Tech Act), there has been an increased attention about the role assistive technology can have on improving the functional needs and life skills of individuals with disabilities. The Tech Act provided grants for states to facilitate access, provision, and funding for assistive technology devices and individuals with disabilities. The act also brought upon a greater public awareness in the use of assistive technology supporting individuals with disabilities to improve their lives. The Tech Act was amended in 1994 to further redirect away from medical philosophies and put a larger focus on assistive technology for individuals with disabilities within the contexts of school, work, and community (Alper & Raharinirina, 2006).

In 2004, The Improving Access to Assistive Technology for Individuals with Disabilities Act under IDEA regulations was signed and implemented to ensure the funding of assistive technology. The goal of the act is to provide assistive technology to individuals with disabilities, so they can more fully participate in education, employment, and daily activities on a level playing field with other members of their communities. A major idea that came out of the 2004 Act was that assistive technology needs to be addressed yearly during individual family service plans (IFSP) and individualized education program (IEP) meetings for all students in special education. Another important aspect of the 2004 Act was that previous law expired each year, unless it's authorization (or license to continue to do business and to be considered in the annual budget) was renewed. This meant that advocates had to lobby Congress each year for a waiver of these provisions to continue the provisions of the law and to obtain appropriations to fund the programs (Watson, 2010). Under IDEA regulations, assistive technology can be considered as a special education service, a related service, or a supplementary aid or service to be provided to support students to be educated in their least restrictive environments. It's important to note the impacts that the legislation has made towards providing appropriate assistive technology options for individuals who need it.

The federal definition of assistive technology is: “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 functional capabilities of individuals with disabilities” [20 U.S.C. Chapter 33, Section 1401 (25)]. Assistive technology can be anything that helps a person with a disability perform a task. Assistive technology can be defined as both a “device” and a “service” as it is outlined in the Individuals with Disabilities Education Improvement Act of 2004. When defined as an assistive technology device, the definition is “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. The term does not include a medical device that is surgically implanted, or the replacement of such a device.” (34 C.F.R. § 300.5). The term assistive technology service refers to any service that directly assists a child with a disability in the selection, acquisition, or use of an assistive technology device. The term can include the evaluation of the needs of an individual with a disability (including the functional evaluation of the child in the child’s customary environment), the purchasing, leasing, or otherwise providing for the acquisition of assistive technology devices by individuals with disabilities, the selecting, designing, fitting, customizing, adapting, applying, maintaining, repairing, or replacing assistive technology devices, the coordination and use of other therapies, interventions, or services with assistive technology devices (such as those associated with existing education and rehabilitation plans and programs), training or technical assistance for a child with a disability or their family, and/or training or technical assistance for professionals, employers, or other individuals who provide services to, employers, or other individuals who provide services to, employ, or are involved in the major functions of the individual (MN Department of Education, 2021). The main difference between a device and service is that a device refers to a specific type of “product” used to enhance the functional capabilities of students with disabilities and services are the support necessary to assess the need and to encourage and promote use of the device.

Assistive technology devices can range from very “low tech” (such as a pencil with a grip) to much more complex technologies (such as voice-activated computer and environmental controls). Although such terms as “adaptive technology” or “access technology” appear extensively in special education literature, the definition of assistive technology in the federal law is intended to cover a broad range of devices and services that can be used by students with disabilities to participate in their educational programs. A key part of the definition is that assistive technology enhances the functional capabilities of students with disabilities (Alper & Raharinirina, 2006). The requirements in IDEA are clearly intended to provide students with increased access to general education programs.

Benefits of assistive technology in early childhood

Children with disabilities have the right to participate in their various environments in similar ways that peers without disabilities have. Using assistive technology appropriately with children at home, at school, in the community, during playgroups, and all settings support inclusion and natural learning opportunities for infants, toddlers, and preschoolers. This will allow young children the ability to access all settings and services that are available to everyone. Assistive technology can be useful to help children increase developmental skills and provide solutions to challenges that could include behavior, communication, and attention. Children with disabilities or who are at risk of having disabilities may have problems in the demonstration of expected performance in specific areas of development (cognitive, communication, motor, adaptive/self-help, and social/emotional) as well as possibly affecting participation in functional activities (circle time, snack time, transitions, group time, tablework, etc.). Assistive technology can be very beneficial for students behind on developmental milestones or with disabilities, because it allows them to compensate for the deficits that occur in their environments and skills (Parette & Stoner, 2008). In definition, assistive technology compensates for skills that a child is unable to functionally perform. The use of assistive technology allows children with disabilities to be included in the curriculum, activities, and environment at school, home, or the community. Assistive

technology can support young children in building skills, increasing their participation in activities, enhancing their learning, prompting their development, and boosting self-esteem.

There are a variety of benefits of using assistive technology with infants, toddlers, and young children. This can include helping a child to participate more actively in family, school, and community activities, playing successfully with toys, interacting with peers, communicating wants, needs, and ideas, making choices, and moving independently. Assistive technology services and devices allow children important opportunities to learn and interact in their world in ways that might not have been possible otherwise. Assistive technology can use a child's areas of strength to work on their areas of concern. Advances in the knowledge base of the field of assistive technology support the continuity of understanding benefits of assistive technology that might not have been discussed yet (Parette & Dikter, 2006). Assistive technology encourages possibilities and provides many more opportunities for children with disabilities to participate in all environments.

Types of assistive technology devices

The broad definition of assistive technology devices suggests that assistive technology can range from very simple to very complex, depending on each individual student's strengths, needs, and circumstances. There are a variety of methods to address the specific types of assistive technology that each individual student may need. The Wisconsin Assistive Technology Initiative (WATI) Assistive Technology Checklist, divided assistive technology into a number of categories and subcategories (Best, 2010). Assistive technology devices and strategies are arranged into a hierarchy that lists low technology options to more complex high technology options. The checklist is compiled like this in order to try selecting simple low technology options before moving towards more complex options to support students. The WATI Assistive Technology Checklist also includes a space for new assistive technology options, as many new products and devices are developed each year. The checklist's main assistive technology categories are writing, communication, reading/studying/math, recreation and leisure, activities of daily living, mobility, environmental control, positioning and seating, vision, and hearing. The category of writing is broken into mechanics of writing, alternate computer access, and composing

written material. The reading/studying/math category is broken into reading, learning/studying, and math (Best, 2010). Within each section of the list, ideas for assistive technology devices are listed to help students be successful in each specific area, which is determined based on the strengths and needs of the individual student. Examples of writing assistive technology devices include adapted paper, word cards, portable word processor, switch with scanning, and voice recognition software. Examples of communication include communication boards, voice output devices, and cannon communicators. Examples of reading/studying/math include changes in text size, spacing, color, book adapted for page turning, highlighting of text, talking calculator, and voice output measuring devices. Examples of recreation/leisure adapted handles for toys, battery interrupter and switch to operate toys, modified utensils, and music software on the computer. Examples of daily living include non-slip materials to hold things in place, color coded items for organizing, and adaptive drinking devices. Examples of mobility include walker, grab bars and rail, manual wheelchair, and an adaptive vehicle for driving. Environment control examples can include light switch extensions and remote control appliances. Positioning and seating could be a rolled towel, wheelchair insert, or stander. Vision assistive technology devices can include eyeglasses, screen magnification, or a braille keyboard. Examples of hearing include pen and paper, hearing aid, FM system, and phone amplifier.

The Minnesota Department of Education also is another resource to consider when determining categories of assistive technology devices. Minnesota has ten main categories for sorting assistive technology devices in all areas of an individual's life. These categories include; vision, hearing, speech communication, learning/cognition/developmental, mobility/seating/positioning, daily living, environmental adaptations, vehicle modifications/transportation, computers/related peripherals, and recreation/sports/leisure (MDE, 2021). Within each category, MDE gives a variety of examples of assistive technology devices relating to that category in order to help increase independence. Examples of vision assistive technology devices include maginifers, screen reading, and text-to-speech softwares. Examples of hearing can include personal amplifier systems, doorbell with a flashing light alert, and vibrating alarm clocks. Examples of speech communication devices include fluency assistance devices,

communication boards, and symbol-making software. Learning/cognition/developmental assistive technology devices can include memory aids, note taking systems, and audio books. Examples of mobility/seating/positioning include canes, scooters, and powerchairs. Assistive technology devices for daily living include long handle shoe horns, reachers, and switch adapted appliances. Environmental adaptations include ramps, door openers, and switch activation of electronics. Examples of vehicle modifications/transportation include hand controls, tie and lock downs for wheelchairs, and raised roofs. Computers and other related peripherals examples include alternative keyboards, input devices, and voice recognition. Assistive technology devices in relation to recreation/sports/leisure include playing card shuffler, camera mounts, and adaptive sporting equipment.

Another way to categorize assistive technology in early childhood is by technical level. This includes low technologies, mid technologies, and high technologies (Sadao & Robinson, 2010). Low technologies increase access to books, games, and activities. Functional areas that can be targeted in communication, motor, play, and literacy. The cost of these types of technologies are usually on the lower end and there is often not a lot of training needed. Some examples of low technologies include slant boards, page turners, communication symbols, visuals, and daily schedules. Mid technologies can provide a voice for a nonverbal child and offer access to learning social opportunities. Functional areas that can be focused on are communication, motor, play, and literacy. Mid tech options are usually at the midpoint in price and often need training. Some examples of middle assistive technologies include adapted toys, basic switches, message devices, software, and touchscreens. High technologies are the most complex devices or equipment. These often require expensive training and are some of the most expensive options. Examples of high tech assistive technology include augmentative and alternative communication systems, iPads, electronic Braille, and text to speech. Research shows that assistive technology in early childhood tends to be on the backburner of supports to utilize when supporting overall development (Sadao & Robinson, 2010).

When looking at what assistive technology is appropriate for individuals, research has shown that it can work best to try low technology devices and then move to high technology devices. Research by

Tshiswak (2015) has shown that there is typically a 10% higher usage rate of high technology devices than low technology devices based on 14,000 random survey participants of educators using assistive technology in the school (Tshiswaka et. al, 2015). This shows that educators, therapists, and others involved with students with disabilities may be more drawn immediately to use the most complex solutions without trying alternatives first. Checklists and other categorical lists are a good place to start to help educators think of ideas of different types of assistive technologies to use with their students. While the categories and types of assistive technology devices can differ, all assistive technology is used to help individuals access their environments, learn, and improve quality of life. The type of assistive technology device that should be used with a student will depend on the student's disability, strengths, concerns, and present levels.

Determining assistive technology in early childhood

IDEA states that assistive technology services and/or devices are considered and provided if the student needs them. Under IDEA when deciding if something is “needed,” it is dependent upon whether or not it is necessary for a student to receive a free and appropriate education (FAPE). The IEP must consider FAPE when determining whether a particular AT device or service would just be “nice” to have or if it is really necessary, meaning without it the student would not be receiving FAPE (Best, 2010). The team needs to collect enough knowledge to consider the student’s need to make good assistive technology determinations. Consideration is a brief process that can take place in every IEP meeting and to think about whether or not assistive technology would be necessary, a majority of the IEP should be developed in order for team members to evaluate the student’s goals. Annual goals and objectives that the student will be working towards is the focus of the discussion about what assistive technologies would assist or allow the student to accomplish the goals and objectives.

One way to determine assistive technology needs is to use the SETT framework. SETT stands for Student-centered, Environmentally useful, and Tasks-focused Tool systems that foster the educational success of students with disabilities (Abend, 2017). The SETT framework is built on the idea that in order to develop appropriate systems of assistive technology devices and services, teams need to gather

information about the student, environments in which students spend their time, and the tasks that are required for the students to be active participants in their learning and education. The SETT framework emphasises collaboration, communication, multiple perspectives, pertinent information, shared knowledge, flexibility, and on-going processes. The SETT Framework is based on the premise that in order to develop an appropriate system of Tools (supports –devices, services, strategies, accommodations, modifications, etc.) teams must first develop a shared understanding of the student, the customary environments in which the student spends time, and the tasks that are required for the student to be able to do or learn to do to be an active participant in the teaching/learning processes that lead to educational success. When the needs, abilities, and interests of the Student, the details of the Environments, and the specific Tasks required of students in those environments are fully explored, teams are able to consider what needs to be included in a system of tools that is student-centered, environmentally useful, and tasks focused.

Teachers can ask themselves the following questions during the SETT process (Zabala, 2005): in relation to the student, what are their functional areas of concern? What does the student need to be able to do that is difficult or impossible to do independently at this time? What are the special needs in relation to areas of concern? What are the child's current abilities when related to the areas of concern? What are the expectations, concerns, interests, and preferences of the child. Questions to ask about the environments include; what the arrangements are, physical and instructional, what support is available to the student and to the staff, what the materials and equipment that are commonly used by others in the environment, are there access issues such as technological, physical, or instructional, and what are the attitudes and expectations of individuals involved with the child. In relation to the tasks, what specific tasks occur in the student's natural environments that enable progress toward mastery of IEP goals and objectives and what specific tasks are required for active involvement in identified environments (related to communication, instruction, participation, productivity, environmental control)? In the SETT Framework, Tools include devices, services, strategies, training, accommodations, modifications—everything that is needed to help the student succeed. Some parts of the Tool system address the specific

needs of the student, while parts of the Tool system may more specifically address issues in the Environments, such as access to the classroom, accessibility of instructional materials, support for staff that helps them develop and sustain learning environments that are inviting, challenging, and productive for all students, including those with the full range of abilities and special needs. When determining what the needs to be in the system of Tools to support and increase the achievement of a student, team members analyze the information gathered on the Student, the Environments, and the Tasks to address the following questions and activities: Is it expected that the student will not be able to make reasonable progress toward educational goals without assistive technology devices and services? If yes, describe what a useful system of supports, devices, and services for the student would be like if there were such a system of Tools. Brainstorm specific Tools that could be included in a system that addresses student needs. Select the most promising Tools for trials in the natural environments. Plan the specifics of the trial (expected changes, when/how tools will be used, cues, etc.), and finally collect data on effectiveness.

Once a tool is chosen it is important to have everyone properly trained in its use, know who is responsible for repairs or updates, collect data on its use, and continue to monitor for concerns. Assistive technology is always a work in progress, it can be changed to make sure the needs of the student are being met appropriately by the chosen assistive technology. You wouldn't want to continue to use the assistive technology if it is not the best fit for your student. Assessment of assistive technology will help teachers to get the assistive technology that is the most appropriate for the student based on the student, the environment, and the tasks the student will need to perform. It is important to note that the use of the SETT framework is not mandated through regulations or an official manual, it is considered a resource and tool to help in the consideration of assistive technology for students (Abend, 2017).

Some additional approaches to assistive technology assessments include the Lifespace Access Profile for Individuals with Severe or Multiple Disabilities (LAP), Wisconsin Assistive technology Initiative (WATI), and the Education Tech Points (ETP) (Sadao & Robinson, 2010). The LAP is a tool designed for team members with different areas of expertise to collect observational data in their different perspectives

in a systematic process. It is intended to be used with students with severe disabilities and is a way for all team members to synthesize information when developing IFSP or IEP goals to support and define assistive technology services and devices for the individual student. The WATI provides a comprehensive assistive technology assessment process that includes a resource manual for team members. The WATI has 10 sections with specific guidelines for areas such as writing/computer access, communication, academics, recreation, leisure, activities of daily living, environmental control, positioning, seating, vision, and hearing. The WATI provides information to the IEP team to help determine assistive technology services and devices needed to meet IFSP and IEP goals. The ETP model is a guide for assistive technology teams to use for six points in the assessment, intervention, and evaluation process for IFSP and IEP goals. The ETP has a manual containing information on team building, components of effective assistive technology service delivery, and systems changes.

Specifically in early childhood, Dugan, Campbell, and Wilcox (2006) discuss four interrelated domains that should be considered when determining assistive technology use. The first domain focuses on child factors and whether or not assistive technology is related to the child's goals, if the interventions are practical for the child, and if devices match with student strengths and needs. The second domain talks about assistive technology device features. This is a device's potential to increase performance, and practical considerations such as cost, ease of use, comfort, durability, dependability, transportability, and adaptability. The third domain deals with service system factors that are directly related to the service systems ability to provide the needed assistive technology devices and services. This can include financing options, protection from theft and damage, training needs, transportation, and transition needs. The fourth domain is family factors in which the focus is on the family's needs, preferences, abilities, and experiences. Collaboration is crucial during this domain and there is a large focus on the family-centered approach (Dugan, Campbell, Wilcox, 2006). When concerning assistive technology with early childhood, research shows that family-centered approaches lead to the best decisions about the most appropriate

assistive technologies for the child. During this stage in life, families know the children best, so working closely with families provides crucial information to support the child.

Implementing assistive technology in early childhood

Assistive technology for early childhood offers a range of support from simple tools to more sophisticated tools to support children in the participation in school, home, and community. Implementing assistive technology for young children with disabilities requires collaboration from the entire team, beginning with the family and is based on family priorities, team assessments results, and development of IFSP and IEP. Factors that affect the implementation of assistive technology include the specific goals for the child, the philosophy and resulting expectations of the selected environments, the degree of structure that is feasible in the given environment, the specific routine and activities during the child's day, the individuals responsible for implementation, and follow-up evaluation procedures (Sadao & Robinson, 2010).

One way that educators can implement assistive technology in early childhood is by using toolkits. An assistive technology toolkit is a proactive approach to implement principles of universal design for learning to create flexible goals, teaching methods, materials, and assessments to accommodate learner differences (Judge, et. al., 2008). The assistive technology tools that are associated with the children's daily activities (playing, communicating, exploring the classroom, etc.) are available as needed to support all of the students in the classroom. By having a variety of assistive technology devices in the classroom, there are more opportunities for technology integration. Assistive technology toolkits have the ability to anticipate the cognitive, social/emotional, communication, adaptive, motor, and sensory needs of the children to support the immediate access to meaningful experiences and participation in all classroom activities (Puckett, 2005). Instead of following an individual child's needs, these tool kits are associated with the daily activities and are available when needed for support to many children. There are a variety of assistive technology devices that can be included in the toolkit such as visual schedules, calendars, pictures, picture communication symbols, adaptive scissors, toys, slant boards, talking boards,

adaptive seating, boards of objects, positioning devices, velcro shoes, standers, weighted vests or blankets, chewies, bead chains, pencil grips, and adaptive keyboards. Judge's (2008) research about assistive technology toolkits suggests that communication assistive technology devices are the most used with early childhood. With the variety of assistive technology devices that would be included in a toolkit, none of the tools that were mentioned had a rating of never or seldomly being used in the classroom (Judge, 2006). This means that all tools can be seen as viable and practicable tools to use in early childhood settings to promote learning, communication, equalizing opportunities, and creating positive changes in the learning environment. An assistive technology toolkit is able to help young children with disabilities immediately access experiences and their environments to support their growth, development, and learning. Assistive technology toolkits also cut down on the time that educators need to spend looking through a large variety of assistive technology devices and instead effectively allow educators to make decisions about assistive technology devices to use within the early childhood settings.

Specifically, children with physical health disabilities often experience participation limitations in the classroom due to lack of access to curriculum activities. Implementing assistive technology allows these children to break down those barriers and have similar opportunities as their classroom peers do. Implementing the correct assistive technologies to use with children with physical health disabilities will be dependent on each individual child. According to a research study conducted by Murchland (2011), there are different patterns of assistive technology usage depending on the different diagnoses of the children. This study looked at high tech assistive technology devices for support during literacy tasks within the classroom curriculum. For example children with bone or joint disorders tend to benefit from using desktop computers instead of laptop computers. Children with muscular dystrophy were more likely to use a portable text generating hardware device instead of a computer. Children with neurological disorders were more successful using word prediction software (Murchland, 2011). This study provides some great insight about the assistive technology devices that are more likely to benefit certain types of diagnosis based on the characteristics of those diagnoses. Although the study does explain how educators need to take this research with a grain of salt, and to make sure to consider specific strengths and needs of

the individual child. This article can be a good place to start when researching assistive technology devices to help with literacy for specific diagnoses.

Perspectives of assistive technology in early childhood

Assistive technology has the potential to enhance the lives of individuals with disabilities, including infants, toddlers, and preschoolers with disabilities by providing support to actively participate in their daily routines and activities. When assistive technology is incorporated into a child's natural environment, these children have access to experiences that were not previously available to them. For these younger students, it is important to take into perspective the thoughts and attitudes from the individuals who are closest to the children, including their caregivers and teachers. Overall caregivers and school teachers have a positive view about the benefits of assistive technology being used with their child to support their growth. Research shows that classroom teachers believe that the use of assistive technology devices enable young children to bypass their weakness and use their strengths to reach their potential, which ultimately helps them to compensate for their perceived deficits (Tamakloe & Agbenyega, 2017). Caregivers also expressed the important role that early intervention teachers and other special education teachers play in teaching caregivers about assistive technology and how to effectively use it. When caregivers and educators collaborate and work closely together, caregivers report that they feel more competent in identifying solutions for facilitating their child's ability to participate in routines and activities throughout the day and how to support them using assistive technology (Kling, et. al., 2010).

While assistive technology is viewed positively by caregivers and classroom teachers, there are also limitations to their use. One limitation is if educators do not know enough information to involve caregivers in assistive technology decisions. In these situations, educators may not feel comfortable teaching caregivers about assistive technology and how to implement it with their child. Some overall major factors creating a gap between assistive technology availability and assistive technology implementation include parent and professional lack of understanding about the effectiveness of its use, minimal prospects of learning more about the advantages of assistive technology in supporting inclusive

learning environments, variations in parent and professional perspectives regarding what constitutes assistive technology tools for young children, and a solid grasp of the possibilities for enhancing a young child's learning and growth by using assistive technology supports (Sadao & Robinson, 2010).

Conclusion

Assistive technology has revolutionized the world that children with disabilities live in. Assistive technology for young children and their families provide an opportunity to access learning environments that were previously out of their reach. Young children explore their environment through play, communication, and movement. Assistive technology devices can be used in all of these environments to help children develop the necessary skills to access their environment, develop, and learn. Assistive technology includes a range of low technology adaptations such as adding page turners to a book or creating picture schedules. Mid technology options can include battery adapters for toys or voice overs. Higher technology solutions can include sophisticated voice output communication systems. Assistive technology has a variety of benefits and truly is a way to connect children with learning opportunities with their daily routines. Determining assistive technology can be done in different ways and needs to be discussed in IFSP or IEP documents. Implementation of assistive technology allows young children to better access their world and participate in their day as their typically developing peers are able to do. In early childhood, collaboration is key when discussing assistive technology. Team members, including the child's caregivers and family, need to all be included to make the best decisions about what assistive technologies would benefit the child. It's important to take perspectives from caregivers and general education teachers when implementing assistive technology in the child's natural environments. When used appropriately, assistive technology is one big way that can improve the quality of life for young children with disabilities.

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