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Tech for Understanding: An Introduction to Assistive and Instructional Technology in the Classroom

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Tech for Understanding:
An Introduction to Assistive and Instructional Technology in the Classroom
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Abstract

This paper examines the different types of assistive and instructional technology available to students who are classified with one or more of the thirteen disabilities outlined in the Individuals with Disabilities Education Act (referred to as, IDEA). While the roles of assistive and instructional technology are different, there are many instances where their uses may overlap. Thus, while these two categories will be discussed separately, it should be noted that some information may be applied to each category and more than one piece of technology. The purpose of this paper is to provide an introduction to the world of assistive and instructional technology for those who may be new to its concepts, particularly parents who have recently learned that their child may benefit from extra assistance and future educators who are interested in learning more about the devices they will be using to reach their students. After each of the thirteen disabilities is discussed briefly, each disability will then be assigned several types of assistive and instructional technology that serve it well. This will by no means be an exhaustive list of all types of technology available to teachers, parents, and students. However, it will attempt to provide a varied glimpse at some of the options that are available and how they may help children who are struggling to access the curriculum.

TECH FOR UNDERSTANDING

If one says that every child has different abilities, he or she would be correct in making such a statement. After all, some children excel in sports while others excel in music. Some kids prefer math while some enjoy reading. Every child is unique, and each one presents his or her own sets of abilities and challenges. This is true especially for those children who have disabilities. According to Merriam-Webster, a disability can be defined as “a physical, mental, cognitive, or developmental condition that impairs, interferes with, or limits a person’s ability to engage in certain tasks or actions or participate in typical daily activities and interactions” (Disability). The Individuals with Disabilities Education Act (IDEA) outlines the 13 different disabilities that qualify children in the United States for special education services. The disabilities are the following: autism, deaf-blindness, deafness, developmental delay, emotional disturbance, hearing impairment, intellectual disability, multiple disabilities, orthopedic impairment, specific learning disability, speech or language impairment, traumatic brain injury, and visual impairment, including blindness (Center for Parent Information & Resources, 2017). Children with such disabilities often face sometimes seemingly insurmountable obstacles in their daily lives, particularly in the field of education.

The goals of instructional and assistive technology are to address these types of obstacles and provide means of support to help students access the curriculum as easily as possible (Figure 1). While it is difficult to find a concise definition for instructional technology, it is safe to say that instructional technology is any type of device or program that assists the student in the learning process. According to Section 3.5 of the United States Assistive Technology Act of 2004, an assistive technology device is 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” (Assistive Technology Act of 2004). In educational terms, assistive technology helps students access learning (Figure 2). Thus, both of these types of technology, although they serve students in slightly different capacities, provide the assistance exceptional students need to excel and demonstrate their own special gifts in the classroom.

The 13 Categories of Disability

Autism (AU)

Until 1990, autism was only recognized as a syndrome and not as a category within special education (Hunt, 2013, 9-1a). Thanks to IDEA, however, autism spectrum disorders are now receiving more and more attention because of their addition to the list of 13 disabilities. Autism is perhaps one of the most varied conditions that affects exceptional children because of the many different ways in which it manifests. It is a developmental disability that affects both verbal and nonverbal communication, social interactions, adaptation to change. It can also cause repetitive behaviors, social insecurity, obsession with certain topics, and strange responses to sensations. There is no perfect picture of a child with autism because autism affects each child differently. Some students can function very well in normal settings (these students are considered high functioning), while others cannot function in normal settings at all (very low functioning). However, most children begin exhibiting autistic behaviors by the age of three and, therefore, receive a diagnosis by the time they enter the elementary school classroom. Estimates state approximately autism affects 1 in 59 children with 1 in 37 boys being affected (Autism Speaks, n.d.). However, the numbers are still growing and more research is being conducted each day to discover how to better serve autistic students and their families.

Deafness (d), Hearing Loss (HL) (including Blindness), and Deaf-Blindness (DB)

These three categories are overlapping, so they will be discussed together. A child is considered to be suffering from deafness when he or she cannot process linguistic information with or without the use of an amplifying device (Hunt, 2013, 11-1). Hearing loss – also called hearing impairment - is an umbrella term in the sense that it encompasses many different degrees of hearing loss. (11-1). For a child to receive special education services under IDEA, his or her educational performance must be affected by this sight loss. Deaf-Blindness includes a combination of visual and hearing impairments that are so severe that the child has extreme difficulty communicating and participating in educational programs (National Center on Deaf-Blindness, n.d.). Typically, there are other disabilities that accompany this diagnosis, and these children require a very unique education plan to meet their needs.

Developmental Delay (DD)

The term, “developmental delay” has been used by many people to mean different things. However, legislation states that a developmental delay is “a significant discrepancy in the actual functioning of an infant, toddler, or child, birth through age 5, when compared with the functioning of a non-disabled infant, toddler, or child of the same chronological age in any of the following areas: physical, cognitive, communication, social or emotional, and adaptive development...” (USLegal, n.d.). Of course, while there are countless ways in which a child can be delayed in his or her development, the five developmental areas that are generally recognized are: physical development, cognitive development, communication development, social or emotional development, and adaptive development (Center for Parent Information & Resources, 2016). Physical development refers to the fine and gross motor skills that children develop and improve upon, especially as they explore their surroundings and their own bodies. Cognitive

development references intellectual abilities, particularly those utilized in the school setting.

Communication development can be interpreted as speech, language and the process by which a child makes his or her point known and listens to the opinions of others. Social or emotional development refers to social skills and the ability to control and regulate emotions, and adaptive development means the skills children learn regarding how to care for themselves.

Emotional Disturbance (ED)

An emotional disturbance occurs when a child has extreme difficulty learning, cannot build interpersonal relationships, exhibits strange behaviors, is unhappy or depressed, or displays physical symptoms or fears (Virginia Department of Education, n.d.). While its name implies that only the emotional realm is affected, emotional disturbance usually affects the physical, social, and cognitive realms as well (Council for Exceptional Children, n.d.). Many children exhibit behavior changes from time to time, but children with emotional disturbances experience a complete personality change that lasts for a substantial period of time. Some children act immaturely or aggressively, while other children exhibit learning difficulties or aggression. Some specific examples are anxiety disorders, bipolar disorder, conduct disorder, eating disorders, obsessive –compulsive disorder, and psychotic disorders. Thus, while there are many potential causes of emotional disturbance, there are also many manifestations of this disorder.

Intellectual Disabilities (ID)

The term “intellectual disability” has seen several word changes in its lifetime as researchers reach a better understanding of what this type of disability is and how it is manifested (Hunt, 2013, 6-1). Officially, an intellectual disability is currently defined as: “a disability characterized by significant limitations in both intellectual functioning and in adaptive behavior, which covers many everyday social and practical skills” (American Association on Intellectual

and Developmental Disabilities, n.d.). “Intellectual functioning” refers to the one’s mental capacity and the ability to learn, reason, and problem solve, while “adaptive behavior” refers to conceptual, social, and practical skills that are performed in everyday life. Unlike some other disabilities, intellectual disabilities will manifest themselves before the student turns 18. These disabilities affect the overall development of a child and can take many different forms with many different characteristics (Hunt, 2013, 6-3). Cognitively, these children function at a lower level than others their age and may have difficulties with metacognition, memory, attention, or generalizations (6-3a). Linguistically, these children may simply not develop their communication skills at the same rate as their peers (6-3b). Physically speaking, differences in appearance become more prominent as the disability intensifies (6-3c). Socially and emotionally, these same children may not interact well with others and they may display immature behavior (6-3d). They may also become emotionally exasperated more easily than their non-developmentally challenged peers. Overall, these students face difficulties in everyday life that many people have never considered.

Multiple Disabilities (MD)

It is also possible for a child to have more than one disability. When this occurs, it is said that he or she has multiple disabilities (Center for Parent Information & Research, 2015). There are countless combinations of disabilities that can affect the child, and each disability varies in degree of severity. However, even with these variations between children, there are a few causes of multiple disabilities that are common, such as chromosomal abnormalities, premature birth, infections, and accidents. In order for the student to receive special education services in school, her or she must demonstrate that the combination of disabilities has a direct and negative impact on his or her schoolwork. Almost all of these children will need care throughout their lives, and

many may not even be able to complete life tasks - reading, walking, speaking, learning, and eating - on their own. Once again, every child is different, and it is important to evaluate each child based on his or her specific needs rather than generalizing all children simply because they may share the same label.

Orthopedic Impairment (OI)

The term “orthopedic impairment” refers to physical disabilities that are “caused by a congenital anomaly (e.g., clubfoot, absence of some member, etc.), an impairment caused by disease (e.g., poliomyelitis, bone tuberculosis, etc.), and an impairment from any other cause (e.g., cerebral palsy, amputations, and fractures or burns which cause contractures)” (Hunt, 2013, 13-1a). Orthopedic impairments typically target the skeletal, muscular, and/or neurological systems in at least some capacity. It is important to note that the presence of such physical disabilities does not necessitate the presence of a mental disability. In fact, many individuals who have an orthopedic impairment do not have any sort of mental disability. This group of students is perhaps one of the smallest groups that falls under IDEA (13-1c).

Other Health Impairment (OHI)

All of the disabilities that do not seem to have a perfect fit under any other category generally fall under the umbrella term, “other health impairment” (Project Ideal, n.d.). Among the disabilities in this category, AD/HD (Attention Deficit/Hyperactivity Disorder) is perhaps the most prevalent. Others include diabetes, asthma, hemophilia, leukemia, sickle cell anemia, nephritis, epilepsy, cardiac conditions, and rheumatic fever. Ultimately, no matter the disability, the student’s academic performance must be adversely impacted as a result of having the disability. For children who are already learning how to control their symptoms with the use of medication, special education services are generally not necessary. Often, it is important to note

that OHI's affect not only the physical or cognitive personalities of the student but also the mental and behavioral domains.

Specific Learning Disability (SLD)

Disabilities that interfere with students' abilities to use language typically fall under the category of a specific learning disability (IDEA, n.d.). Many times, these students have difficulty speaking and listening, reading and writing, doing mathematical calculations, and spelling. One of the most commonly known of the SLDs is dyslexia, which causes difficulties in recognizing and decoding words (International Dyslexia Association, n.d.). Similar to dyslexia, dysgraphia affects a child's writing abilities such that the child has difficulty sizing his or her letters and spells incorrectly (National Institute of Neurological Disorders and Stroke, n.d.). Other conditions include minimal brain dysfunction, developmental aphasia, and perceptual disabilities (IDEA, n.d.). Thus, because this group of disabilities typically affects students' language usage, it often affects academic performance as well.

Speech or Language Impairment (SLI)

This category of learning disabilities can take several different forms. To begin, a speech disorder is considered "an impairment of the articulation of speech sounds, fluency and/or voice" (American Speech-Language-Hearing Association, n.d.). Furthermore, a language disorder is seen as "impaired comprehension and/or use of spoken, written and/or other symbol systems." In essence, these two specific types of disorders impair students' abilities to communicate using verbal, nonverbal and graphic symbols. Oftentimes, a speech-language pathologist will come alongside the student, teacher, and parents to help find a way for the child to communicate more easily. Some students only have difficulties with a lisp, while others may not be able to speak at all. Thus, the range of severity is extremely wide, and the education community must be ready

and willing to accommodate for these differences so that each child receives and communicates the information necessary for them to access the material.

Traumatic Brain Injury (TBI)

A traumatic brain injury is exactly what it sounds like – a traumatic blow to the brain. This blow can be caused by an object penetrating brain tissue or a violent jolt to the head or body (Mayo Clinic, n.d.). Sometimes, the injury is mild and the brain will repair itself over time. However, there are other times when the blow is too severe, and permanent damage has been done. Children who have experienced a mild TBI may suddenly become irritable, have seizures, become depressed and/or tired, cry inconsolably, or are no longer be able to concentrate. However, those who have suffered a severe injury may suddenly be unable to communicate or think as they did before. There are also cases where the child’s behavior or emotional state causes him or her to be unrecognizable to those around him or her. Many times, children such as those described here will require extra supports to find their own place in the classroom.

Visual Impairment, Including Blindness (VI)

A visual impairment is also an umbrella term because it describes all levels of vision loss, from “total blindness to uncorrectable visual limitations” (Hunt, 2013, 12-1). According to IDEA, even with correction, the impairment must negatively affect the child’s academic performance in order to be classified as a VI. There are many different terms, known as “educational definitions,” that help specify the degree of severity and type of vision loss affecting the student, and it is important for teachers and parents to be aware of such language so that they can best communicate with doctors, therapists, and those who have the means to provide correction, if possible. In general, a student with a visual impairment but no other disability should be able to function normally in a classroom with his or her peers (12-3e).

However, if the student begins to show that he or she is struggling, it is necessary that the teacher intervene to guide in the process of finding the right aids to help the child succeed.

Assistive Technology (AT) – Design and Usage

In the field of special education, assistive technology is a crucial and applicable topic. Many of the resources that are used every day by special educators can be classified as pieces of AT. According to Section 3.5 of the United States Assistive Technology Act of 2004, an assistive technology device is 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” (Assistive Technology Act of 2004). Basically, AT refers to the devices that help students access the curriculum that they had previously been unable to reach (Figure 2). In reality, there are no limits with regards to AT, and sometimes AT will overlap with instructional technology (IT). However, this fact only exemplifies the diverse and multifaceted nature of technology. When used intelligently, one piece of technology can fulfill many different productive purposes and serve a variety of students.

Instructional Technology (IT) – Design and Usage

It is extremely difficult to pen an accurate and comprehensive definition to the concept of instructional technology. There are many times when the usages of instructional technology (IT) overlap with those of assistive technology (AT). In the case of IT, however, it can be said that, according to the Assistive Technology Act of 2004, “practices that encompass elements of electronic media (i.e., pictures, videos, sounds) to facilitate acquisition of a novel skill to be performed in the absence of said elements” are considered to be IT (Shepley, 2015, 86). It may be helpful to think of IT as the temporary element, while AT is more permanent (Figure 2). For example, a teacher might use some sort of prompt to guide a student in an activity, and this

would be considered IT. On the other hand, if a child uses text-to-speech software to understand an assignment, this would be classified as AT. It is also the case that, sometimes, educators may deem a type of technology as IT, but the student uses it as AT. Thus, while instructional technology is a vital aspect of educating those with special needs, it is impossible to cover its uses in their entirety. For this purpose, only a few examples will be covered here. Furthermore, while it is true that every child can benefit from a variety of resources, it will be noted which examples may prove most helpful to specific disability categories within IDEA.

Assistive and Instructional Technology – Examples

Autism (AU)

This particular section will examine some tools used to teach and provide opportunities for students with autism. While this is by no means a comprehensive list, it does provide an excellent starting place for teachers and parents seeking to help the student.

Graphic organizers. When students with autism are asked to engage in the writing process, the task can seem rather daunting. In fact, for some students it may seem impossible. Because there are so many interwoven steps involved in writing, it can often be difficult to know where to begin, how to proceed, and when to end. Graphic organizers are a great tool to introduce to all students, especially those with autism (Boser, 2014, 58). The graphic organizers serve as a guide map of sorts so that the blank piece of paper no longer seems so intimidating. They provide a visual breakdown of tasks that can then be translated into formal writing. This piece of technology will benefit not only students with autism, but it will also aid those who have attention deficit disorders, language disorders, or memory problems.

Robots. As odd as it may sound to some, robots can be very useful in the field of education, particularly education for students with autism (Boser, 2014, 191). Of particular

prominence is the use of robots to help students engage in social interaction. This system is designed so that the robot acts as a “scaffold” as it moves children away from solitary play while not immediately exposing them to their peers. Students with autism oftentimes have difficulty relating to others, reading nonverbal cues, listening attentively, or carrying on a conversation. Overall, the research about using robots to teach social interactions is still relatively new, and there is no conclusive evidence about whether it is a fruitful option.

Stress management devices. Students with autism typically respond to certain stimuli in a more extreme manner than do students who are not on the spectrum (Boser, 2014, 216). Thus, it is beneficial for teachers to have some plan of action for how to assist and train their students in techniques that will help them learn how to control their stress and frustration. There are many different programs that teach such techniques that come in many different formats. Many devices present themselves in a video game format that is appealing to children. Oftentimes, content taught includes emotional health, thought processes, breathing exercises, stress reduction, and relaxation tricks. It is also the teacher’s responsibility to reinforce the concepts learned from stress management devices and remind students of them when stress seems to take over a particular situation.

Tabletop displays. Just as its name implies, tabletop displays are interactive screens appearing like a tabletop (Boser, 2014, 194). This piece of technology targets the social difficulties that students with autism experience. Several students can interact with the game or activity at once and learn how to share the space and collaborate appropriately. Problem solving skills are an important skill to teach to students with autism and, by interacting with their peers, they are more likely to learn these skills on a practical level as they seek to complete their assignment. These displays can also be used by therapists and other service providers as aids.

Overall, they are excellent tools to encourage interaction among students in a fun way while reinforcing important concepts.

Video modeling. This is a unique take on an instructional aid that can help students with autism learn new behaviors (Hunt, 2013, 9-4d). There are three basic types of video-modeling. First, there is video prompting. This type of approach requires that a student is shown a video clip of one step and then the student completes that task. Then the next step is shown, and the process continues. Video-modeling itself is when a peer is videoed completing the specified behavior. The student with autism is then asked to replicate what he or she just saw in the video. Finally, video self-modeling is when the student is videoed completing the action with assistance, and then all verbal cues or instructions given during the shooting process are edited out. The end product is the model the student will use. Each student will respond differently to the varying types of video-modeling, and it may even be the case that students will, over time, grow to prefer one method over another.

Visual schedule. Oftentimes, students with autism have difficulty arranging their daily schedules or staying on track with the next event. By providing a visual schedule, preferably with pictures for younger students, teachers are making the day come alive for students with autism so that they are engaged with what they are going to be doing (National Association of Special Education Teachers, n.d.). It will also provide a step-by-step road map that many of these students need to stay on track. To begin, the teacher may create the schedule for the student or allow the student to assist in the process. Over time, however, the student would grow exponentially more in his or her organization abilities if he or she were taught and then encouraged to create the schedule independently. The teacher may still review the schedule upon completion, but the student would make all of the decisions about content and layout. This may

be a process where scaffolding would be beneficial but, overall, it will be very beneficial for the student.

Vocal output communication aids. These aids, also called VOCAs, are very useful in assisting students who may have trouble putting their thoughts into words such as students who are on the Autism Spectrum (Hunt, 2013, 9-4d). VOCAs look like regular communication boards, but when the different symbols are pressed, they produce a speech reading of the picture. Some boards have the capacity to produce small sentences. These devices are portable, so they can be placed on wheelchairs, the floor, or tables.

Deafness (d), Hearing Loss (HL), and Deaf-Blindness (DB)

There are many different advances in technology that can be referenced when searching for tools that can help those who are deaf, deaf-blind, or who have hearing loss. Below are just a few of the possibilities that teachers may consider.

Closed captioning. Watching captioned television is an excellent option for those with hearing impairments (Green, 2011, 76). This is an example of a time when one type of technology could be considered both instructional and assistive. If an educational show or movie is played with closed captions, it is assisting children in accessing the curriculum while simultaneously presenting the curriculum. It should also be noted that children who struggle with learning to read may also benefit from this type of technology.

Speech recognition software. For students who may have a visual or hearing impairment, speech recognition software can help with what many view as basic tasks, such as composing an email or typing an essay. Such technology will help boost students' confidence and increase their independence when competing their assignments (National Center for Technology Innovation, n.d.). Overall, this independence will most likely decrease student

anxiety because of the newfound feelings of self-sufficiency he or she will feel. Students who were once dependent on others to help them complete certain tasks will be able to work independently with the help of speech recognition software. It is also important to note that this software can be very beneficial to students who have physical disabilities or certain learning disabilities, such as dyslexia or dysgraphia.

Developmental Delay (DD)

Many different devices can be used to target children with developmental delays. Here just a few of those devices will be referenced and explained in some detail.

Audiobooks. Children with developmental delays can be delayed in the cognitive and communicative realms, both of which have ties to language. Because of this, there are many instances when students in this category of disability develop linguistically behind other children of their own age. Whether these students have trouble reading or interpreting written language, audiobooks can prove very useful (Lynch, 2018). Audiobooks are easily accessible and affordable options for teachers that can be used in a variety of classroom settings. They will provide the curriculum to the children while removing the distraction of having to understand written expression while simultaneously understanding the content. Furthermore, because audiobooks are so prevalent, parents can find them for their children to use at home to boost their retention skills. In reality, all students, regardless of whether they have disabilities or not, can benefit from occasional use of audiobooks, as the usage stimulates different portions of the brain and allows for variance in the presentation of the curriculum.

FM systems. Because so many students with developmental delays can become easily distracted by the large amount of external stimuli in the classroom, FM systems can prove very helpful (Lynch, 2018). In this setup, students hold a receiver while the teacher holds the

microphone. This blocks out noise from other students while focusing on the lesson being taught by the teacher. This can also be a valuable asset for children with hearing impairments.

Emotional Disturbance (ED)

In this section, self-management programs will be examined as a way to assist students who may have emotional disturbance.

Self-management programs. Although not intended for direct use by students, this type of technology will certainly increase access to the general curriculum for students with disabilities. Self-management programs are available for teachers who want to learn how to serve students with emotional and behavioral disorders better (Hunt, 2013, 8-6d). The mixture of videos and interactive materials will help educators understand the best ways to assess students and develop lesson plans that will support the very unique needs of this group of students. An example of such a program is the Strategy Coach interactive software.

Intellectual Disability (ID)

In the following paragraphs, picture prompts and real-life manipulatives will be discussed as a way to reach students with intellectual disabilities.

Picture Prompts. Students with intellectual disabilities often struggle with initiating and carrying out tasks on their own (Mechling, 2007, 252). Thus, there is typically a form of scaffolding that educators and teachers must carry out to help students learn to be independent. The use of picture prompts is extremely valuable because it transitions the student from receiving verbal cues to receiving visual cues (254). Basically, there are two different types of picture cues. First, there are picture cued multi-step tasks. These prompts incorporate the steps that need to be taken to complete a project and break them down into simple, visual cues. On the other hand, picture cued activity schedules guide students in activities instead of steps. Thus, transitions

between activities and task engagement would fall under this category. Overall, this combination of scaffolding and visual prompts should provide students with IDs with the right amount of help while still guiding them towards independence.

Real-life manipulatives. Many educators see the importance of using manipulatives in the classroom, but some may not be aware of the benefits of using real-life manipulatives in education. In essence, real-life manipulatives are those that do not substitute the object used in everyday life for one that represents that object. For example, students should use real coins when learning about money instead of pieces of paper that are used to represent money. Because students with intellectual disabilities often have difficulty relating concepts or seeing connections, it is important to show them how to make those real-life connections in the classroom. Students will only become more confused if they are asked to substitute an object for another object in the classroom and then use the actual object in the real world.

Multiple Disabilities (MD)

Because students must possess at least two of the other disabilities outlined in IDEA to be considered to have MD, the assistive and instructional technologies that are listed under the other categories may also be applied to this category. Therefore, these devices will not be discussed again here.

Orthopedic Impairments (OI)

Students with orthopedic impairments may need additional assistance and instruction in the classroom. Following are several options that can be explored when addressing these needs.

Alternative input devices. This type of technology is particularly useful for students who are limited in their abilities to control a mouse or keyboard (UC Berkely, n.d.). Some specific examples include head pointers and motion or eye tracking. In essence, head pointers

typically come in the form of sticks that are mounted to the student's head and can be used to push down on the intended keys of the keyboard. Motion or eye tracking devices sense where the user wants the mouse pointer to go and places it there. Both of these pieces are particularly useful for students who have limited or no use of their hands.

Alternative keyboards. For students who have orthopedic impairments, specifically in the arms, shoulders, and back, an alternative keyboard may make the typing process easier and less painful (Infinitec, n.d.). Some of these keyboards adjust to different heights and inclines, while others angle the keys in different directions or present separate keyboards for both the right and left hands. These are excellent options for students who need a keyboard adapted to their specific needs.

Beanbags. As simple as it might sound to some, beanbags are a wonderful resource for the special needs student. They can be positioned under a student's arm or leg to help provide comfort when the student has to sit in the same position for an extended period of time. It is important to remember that when students sit or lay in the same position for too long a period of time, they can develop ulcers or other health ailments. Thus, it is imperative to provide as much support as possible when they are in these positions while allowing them opportunities to change position as much as possible. Along these lines, large beanbags are excellent alternatives to sitting in a wheel chair or desk chair. These options must be provided to students to ensure that they are comfortable while learning.

Other Health Impairment (OHI)

Noise-canceling earphones. Although this may seem more like a "prohibitive" tool rather than an assistive tool, noise-canceling earphones can prove valuable for students who have difficulty concentrating. Because many students with AD/HD are often distracted by external

noise, they will most likely benefit from the opportunity to shut out such distractions while they are completing an assignment. Noise-canceling earphones can be used during independent work time or reading time without affecting the student's interactions with his or her peers.

Recordings of class presentations. For students with a disability such as Tourette Syndrome, it can be very difficult for them to give a class presentation because their speaking anxiety stimulates tics (Kasper, n.d.). These students may know their material well, but when they try to present in front of a live audience, their anxiety overcomes them and there is an onset of motor or vocal tics. To allow these students a way to avoid the onset of tics while still assessing them on the material they are supposed to present, having them pre-record their presentations at home where their anxiety level is lower is a viable option. This will make the experience less traumatic for them while still having them keep up with the work that the rest of the class is doing.

Surveys and polls. Students love to demonstrate their knowledge in front of their teachers and peers, and surveys and polls provide them with a simple way to do that. This is an excellent option for students who are diagnosed with AD/HD because it helps them direct their energy towards the curriculum in an interactive way. In other words, they can engage themselves in the content. There are many options for the teacher who wishes to employ this type of technology. Many internet based survey and polling tools, such as "SurveyMonkey," are available and can be used to gather responses from students during a practice session, quiz, or homework assignment (Walsh, 2014). "Clickers" and "Plickers" are also simple ways to engage students by turning the assessment process into a type of game.

Specific Learning Disability (SLD)

For those students who have specific learning disabilities, the following types of technology may prove useful.

Babakus. For students with dyscalculia or a similar math disability, using the Babakus may improve their math skills (Cognitive Centre, n.d.). The Babakus is made up of slide rulers with an attached, transparent cursor. There are blue horizontal lines that allow students to see the displayed numbers and select certain digits. There are also counting strips that can be used for addition, subtraction, multiplication, and division. The Babakus can be used for many different levels of math proficiencies and can even be downloaded for use on tablet devices.

Videos. One way to engage students, especially those who may have difficulty understanding written instruction, is to present content in the form of a video. For example, if a student struggles to retain what she reads in her textbook, the teacher may choose to find a video on an educational website that presents the material in a visual and auditory manner. This not only makes the curriculum accessible to the child, but it also presents it in a way that is satisfying to her specific learning style.

Word prediction software. For students who have difficulty predicting what words they need to use next in a sentence, word prediction software may prove incredibly useful (Georgia Department of Education, n.d.). For example, any student with a visual perceptual/visual motor deficit, non-verbal learning disability, or language processing disorder may struggle with staying focused and keeping the end goal in sight when writing. Oftentimes, teachers will utilize word prediction software when students have difficulty spelling, because the software will detect the word the student is trying to type and will show the correct spelling. Another use for this technology is for those who have a motor disability. If a student, for whatever reason, has

difficulty typing or cannot type quickly enough to keep up with what is being taught or assessed, he or she will certainly benefit from word prediction software.

Speech or Language Impairment (SLI)

This section will focus on technology that can be applied to the education of students with speech or language impairments.

Alerting devices. Although this device may seem rather basic in form, it is incredibly useful both inside and outside of the classroom. Alerting devices are those that alarm an individual that an action has, will, or should take place. For example, an alerting device may take the form of a specialized alarm clock that wakes up an individual with flashing lights or a gentle vibration. Another example would be a phone that sets off a bright light when it is ringing. Typically, these devices are placed around the house of the individual so that he or she can receive the notification from any room. Although this tool is typically thought of as being used in the home, it would be very useful in the classroom as well. For example, when time is up on a test, a student with a SLI would benefit from having an alerting device on his desk that flashed a light or vibrated the writing surface. This is just one of the many ways in which alerting devices can be incorporated into the classroom, specifically the general education classroom.

Augmentative and alternative communication systems. In the case of a student with an SLI, it is common that a speech-language pathologist will provide the teacher with resource ideas that can be used inside the classroom while the SLP works with the student individually or in small group sessions. Augmentative and alternative communication systems (referred to as, AAC) are viable options for student in this disability category (Illinois University Library, 2018). Three of the main types of AAC will be discussed here.

Unaided communication systems. At its most basic level, this subcategory of AAC refers to body language and related actions (Illinois University Library, 2018). Thus, it does not require external technology at all. Students and teachers may find sign language, gestures, and appropriate body language to be all that is needed to help the student communicate efficiently and better understand what messages are being relayed by the opposite party.

Low-tech AAC. Devices that fall into this subcategory are those that do not require batteries to function (University of Illinois Library, 2018). For example, a student can use a picture board to express something he wants. On an even more basic level, students may find that writing out their message using pencil and paper will be sufficient. Students can also point to certain objects they need, draw pictures, or use a pointer.

High-tech AAC. This subcategory refers to aids that require batteries or electricity of some sort to function. One of the most popular options is the electronic communication board that typically has pictures that can be pressed to produce a response. Furthermore, iPads can now be programmed with AAC apps that serve the same function. Other options include specialized keyboards, special software or customized devices.

Traumatic Brain Injury (TBI)

Teachers of students with traumatic brain injuries may find the following devices to be very useful in the education of these particular students.

Assignment book. Students who have a TBI often find it hard to concentrate on material and organize their thoughts in a systematic matter. Thus, it is very important for teachers to help guide this process. Assignment books will assist both teacher and student in this case, because they will provide a visual representation of the tasks that must be completed in a particular order (Hunt, 2013, 13-2c). The teacher may wish to scaffold this process by working with the student

to create the schedule and then by providing periodic check-ups on the student's progress. As the child becomes more comfortable with the process, he or she may be able to work independently. This, of course, would be the ultimate end goal.

Memory books. As may be expected, students who have suffered from a TBI will most likely have memory issues to some degree. Thus, it is vitally important that teachers take this fact into consideration when deciding how to instruct these children. Memory books provide both the student and the teacher with a tangible way to hold the student accountable for his or her work (Johnson, 2016). Within the pages of the book, one can record important dates, concepts, notes, and ideas. These can then be linked to similar thoughts and will help build brain connectivity for the student. It is important to note, however, that some students may become overwhelmed with the concept of the memory book because of the many colors, pieces of paper, or layout. Furthermore, students may misplace their books or forget to check them. Thus, an electronic version on a smartphone, computer, or tablet may be a more practical and useful option.

Navigational aids. In the public sector, individuals with a TBI often utilize GPS systems because they may have difficulty navigating on their own (Johnson, 2016). In the school environment, while a GPS device may be slightly excessive, it would be useful for these students to have either a map or a human guide who could help them navigate, depending on the severity of the disability. Furthermore, if the student is included in a general education classroom, the teacher may find it a good idea to have the entire class take part by conducting a lesson or unit study on maps and navigation. This would take the pressure off of the student with the TBI and keep him or her from feeling like the exception, and it would undoubtedly help the other students improve their own skills and awareness of their surroundings.

Note taker. Particularly in the middle and high school levels, teachers expect their students to take competent notes during class. For students with a TBI, this can be a rather daunting and sometimes impossible task. There are a few different options to combat this problem. First, a student can dictate what he or she wants to say to another person, who can then write it down. However, this is not a feasible option in the classroom setting because of the disruption it would cause to the other students. Another option is to request a note taker for the student to use quietly at his or her own desk (Johnson, 2016). With these devices, there is often an audio playback option that the student can utilize later when he or she is reviewing the material.

Visual Impairment, Including Blindness (VI)

In this section, technology that can be presented to students with visual impairments, including blindness, will be presented.

Audio graphing calculator. Students with visual impairments have the opportunity to take better ownership of their math studies with the use of an audio graphing calculator (AGC). These devices utilize audio and tactile feedback and are easy to use for anyone who has basic computer skills (ViewPlus, n.d.). ACGs are also viable options for students who have certain motor or learning disabilities, as they provide access to the tools and services through several different avenues.

Braille and adapted math tools. Just as there are adapted versions of electronic math tools, such as calculators, there are also adapted rulers, metre sticks, protractors, callipers, and Braille times tables (Keating, 2008, 669). Typically, tools such as rulers and protractors are modified to include indentations and Braille dots so that visually impaired students can interpret data using only tactile means. They also tend to have non-slip backings so that they can be laid

on desks or other tables and stay in place while the student works. Braille multiplication table charts are relatively inexpensive, yet they are immensely important. They not only provide students with a way to learn multiplication facts, but they also allow them to have the same type of technology that their peers have, only in an adapted version.

Braille printers and notetakers. Devices that enable students to take part in the classroom are among those that allow the concept of the least restrictive environment to take place. Braille printers allow teachers to not only print material in Braille, but they also have the capacity to convert Braille into print (Hunt, 2013, 12-4f). Thus, where at one time students completed their work in Braille and teachers were unable to read it, teachers can now use Braille printers to review these assignments. For the student, however, Braille notetakers are even more useful as they give auditory output along with allowing students to note take in class.

Talking dictionary. Students with visual impairments cannot be expected to utilize a typical classroom dictionary if they cannot read the language in which it is written. Thus, there must be some alternative provided that will serve the same purpose. Talking dictionaries have the capabilities to produce words and their phonetic pronunciations, provide learning games, and look up words (Keating, 2008, 667). These devices are portable and small enough that they can be used almost anywhere. For children in the younger grades, a device such as the Franklin Children's Talking Dictionary will provide spelling words and interactive activities to encourage greater understanding.

Text readers. This type of software is beneficial for all students, not just those who are determined to have a disability. However, in the case of those who do have a disability, text readers can provide access to curriculum that may not have previously been accessible (UC Berkeley, n.d.). Students with visual impairments will find that being able to have text read to

them with the click of a finger expedites the learning process and increases comprehension. This type of software has its limitations but, overall, will prove to be a beneficial tool for both students and educators.

Conclusion

The needs of students are absolutely infinite. However, the world of assistive and instructional technology is incredibly vast and is expanding all the time. However, it is also important to remember that, while technology serves a significant part of the educational process, it does not educate children. Just as Bill Gates said, “Technology is just a tool. In terms of getting the kids working tougher and motivating them, the teacher is the most important” (The Telegraph, 2017). There is no possible way to replace or replicate the impact teachers have on their students. Now, this impact can be either positive or negative, and it should be the goal of each teacher to make sure it is positive. This influence cannot be undermined, nor should it be taken for granted. Each and every student has the ability to reach the highest of peaks with a little help from their teacher and maybe some technology.

References

- American Association on Intellectual and Developmental Disabilities. (n.d.). Definition of Intellectual Disability. Retrieved from: <http://aaidd.org/intellectual-disability/definition>
- American Speech-Language-Hearing Association. (n.d.). Definitions of Communication Disorders and Variations. Retrieved from: <https://www.asha.org/policy/rp1993-00208/>
- Autism Speaks. (n.d.) Facts about Autism. Retrieved from: <https://www.autismspeaks.org/what-autism/facts-about-autism>
- Boser, K. I., Goodwin, W. S., & Wayland, S. C. (2014). *Technology tools for students with autism: Innovations that enhance independence and learning*. Baltimore, Maryland: Paul H. Brookes, Publishing Co.
- Center for Parent Information & Resources. (2015). Multiple Disabilities. Retrieved from: <https://www.parentcenterhub.org/multiple/>
- Center for Parent Information & Resources. (2016). Developmental Delay. Retrieved from: <https://www.parentcenterhub.org/dd/>
- Center for Parent Information & Resources. (2017). Categories of Disability Under IDEA. Retrieved from: <https://www.parentcenterhub.org/categories/>
- Cognitive Centre. (n.d.) Dyscalculia and Babakus. Retrieved from: <http://www.dyscalculiainfo.org>
- Council for Exceptional Children. (n.d.). Behavior Disorders: Definitions, Characteristics & Related Information. Retrieved from: <http://www.ccbd.net/about/ebddefinition>
- Disability. (n.d.). In *Merriman Webster online*. Retrieved from: <https://www.merriam-webster.com/dictionary/disability>

- Georgia Department of Education. (n.d.). Word Prediction Software. Retrieved from:
<http://www.gpat.org/Georgia-Project-for-Assistive-Technology/Pages/WS-Word-Prediction-Software.aspx>
- Green, J. L. (2011). *The Ultimate Guide to Assistive Technology in Special Education*. Waco, TX: Prufrock Press Inc.
- Hunt, N. & Marshall, K. (2013). *Exceptional children and youth (5th edition)*. California: Wadsworth Publishing.
- IDEA. (n.d.). Sec. 300.8 (c) (10). Retrieved from: <https://sites.ed.gov/idea/regs/b/a/300.8/c/10>
- Illinois University Library. (2018). Speech Disorders: Common Assistive Technologies. Retrieved from: <http://guides.library.illinois.edu/c.php?g=613892&p=4265891>
- Infinitec. (n.d.). Alternative Keyboards. Retrieved from: <http://www.infinitec.org/alternative-keyboards>
- International Dyslexia Association. (n.d.). Definition of Dyslexia. Retrieved from: <https://dyslexiaida.org/definition-of-dyslexia/>
- Johnson, K., & Harniss, M. (2016). Assistive Technology in Traumatic Brain Injury. In F. Zollman (Ed), *Manual of Traumatic Brain Injury: Assessment and Management (2nd Ed)* (pp. 308-314). New York: Demos Medical.
- Kasper, Erica. (n.d.). Tourette's Assistive Classroom Technology. Retrieved from: <https://classroom.synonym.com/tourettes-assistive-classroom-technology-12084.html>
- Keating, D. (2008). *Assistive technology for visually impaired and blind people*. Retrieved from: <https://ebookcentral.proquest.com>

Lynch, M. (2018). Assistive Technology to Help Students with Developmental Delays Succeed Academically. Retrieved from: <https://www.thetechadvocate.org/assistive-technology-to-help-students-with-developmental-delays-succeed-academically/>

Mayo Clinic. (n.d.). Traumatic brain injury. Retrieved from: <https://www.mayoclinic.org/diseases-conditions/traumatic-brain-injury/symptoms-causes/syc-20378557>

Mechling, L. C. (2007). Assistive Technology as a Self-Management Tool for Prompting Students with Intellectual Disabilities to Initiate and Complete Daily Tasks: A Literature Review. *Education and Training in Developmental Disabilities*, 42(3), 252-269.
http://daddcec.org/Portals/0/CEC/Autism_Disabilities/Research/Publications/Education_Training_Development_Disabilities/2007v42_Journals/ETDD_200709v42n3p252-269_Assistive_Technology_Self-Management_Tool_Prompting_Students.pdf

National Association of Special Education Teachers. (n.d.). *Assistive Technology for Students with Autism Spectrum Disorders*. Retrieved from: https://www.naset.org/fileadmin/user_upload/Autism_Series/Assist_tech/AssistiveTech_for_Students_W_Autism.pdf

National Center for Technology Innovation. (n.d.). Speech Recognition for Learning. Retrieved from: <http://www.ldonline.org/article/38655/>

National Center on Deaf-Blindness. (n.d.). What is Deaf-Blindness. Retrieved from: <https://nationaldb.org/library/list/3>

National Institute of Neurological Disorders and Stroke. (n.d.). Dysgraphia Information Page. Retrieved from: <https://www.ninds.nih.gov/Disorders/All-Disorders/Dysgraphia-Information-Page>

National Institute on Deafness and Other Communication Disorders. (2017). Assistive Devices for People with Hearing, Voice, Speech, or Language Disorders. Retrieved from:

<https://www.nidcd.nih.gov/health/assistive-devices-people-hearing-voice-speech-or-language-disorders>

Project Ideal. (n.d.). Other Health Impairments. Retrieved from: <http://www.projectidealonline.org/v/health-impairments/>

Shepley, C., Lane, J.D., Ayres, K., & Douglas, K.H. (2015) Assistive and Instructional Technology: Understanding the Differences to Enhance Programming and Teaching. *Young Exceptional Children*, 20(2), 86-98. DOI: 10.1177/1096250615603436

The Telegraph. (2017). Bill Gates quotes: words of wisdom from the Microsoft mogul. Retrieved from: <https://www.telegraph.co.uk/technology/0/bill-gates-quotes-words-wisdom-microsoft-mogul/>

UC Berkeley. (n.d.). Types of Assistive Technology. Retrieved from: <https://webaccess.berkeley.edu/resources/assistive-technology>

USLegal. (n.d.). Developmental Delay Lay and Legal Definition. Retrieved from: <https://definitions.uslegal.com/d/developmental-delay/>

ViewPlus. (n.d.). Audio Graphing Calculator. Retrieved from: <https://viewplus.com/product/audio-graphing-calculator/>

Virginia Department of Education. (n.d.). Emotional Disability. Retrieved from: http://www.doe.virginia.gov/special_ed/disabilities/emotion_disability/index.shtml

Walsh, K. (2014). 10 of the Most Engaging Uses of Instructional Technology. Retrieved from:

<https://www.emergingedtech.com/2014/09/most-engaging-uses-of-instructional-technology/>

Appendix

KEY: ★ Primary (disability most likely to benefit) ✓ Secondary (disabilities also to benefit)		IDEA Disabilities											
		AU	d. HL, DB	DD	ED	ID	OI	OHI	SLD	SLI	TBI	VI	
Technology	Alerting Devices		✓							★			
	Alternative Input Devices						★						
	Alternative Keyboards						★						
	Assignment Book	✓		✓				✓	✓		★		
	Audio Graphing Calculator											★	
	Audiobooks	✓		★					✓	✓			✓
	Augmentative and Alternative Communication Systems			✓			✓				★		
	Babakus	✓								★			
	Beanbags	✓		✓	✓		★	✓	✓	✓			
	Braille and Adapted Math Tools												★
	Braille Printers and Notetakes												★
	Closed Captioning		★						✓	✓			
	FM Systems		✓	★									
	Graphic Organizers	★		✓				✓	✓			✓	
	Memory Books			✓								★	
	Navigational Aids			✓								★	✓
	Noise-Canceling Earphones	✓			✓				★				
	Note Taker	✓		✓					✓			★	✓
	Picture Prompts	✓		✓	✓		★		✓			✓	
	Real-life Manipulatives	✓		✓			★		✓				
	Recordings of Class Presentations								★	✓		✓	
	Self-Management Programs	✓			★								
	Speech Recognition Software		★					✓		✓			
	Stress Management Devices	★			✓								
	Surveys and Polls	✓							★	✓			
	Tabletop Displays	★											
	Talking Dictionary												★
	Text Readers												★
	Video Modeling	★											
	Videos	✓		✓				✓		★	✓	✓	
Visual Schedules	★												
Vocal Output Communication Aids	★												
Word Prediction Software									★				

Figure 1. 13 disabilities under IDEA and the corresponding assistive and instructional technologies suggested to benefit students who have them.

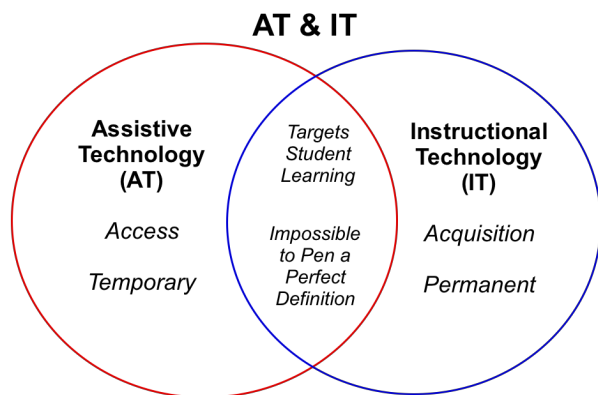


Figure 2. The similarities and differences between AT and IT.