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Using Assistive Technology in Teaching Students with Disabilities

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Abstract

This paper was written to expose the meaning, benefits, and answer in what ways do laws, regulations, resources, district practices, and theoretical understandings of disability and special education influence accessibility and decision- making for students with disabilities in the area of assistive technology (AT)? The paper discussed promotes and detracts from understanding AT in schools and evidenced-based practices to implement AT. It pointed out the potential short term and long-term impact on learners with disabilities of utilizing concepts from WATI, Quality Indicators of AT, the assistive technology continuum (high-low tech), and the SETT Framework. It provided implications of influences (procedures, practices, resources, cost/funding, referral, professional development, attitudes/beliefs) on incorporating assistive technology in schools. It concluded that recommendations for how to address possible obstacles that may influence the implementation of AT in the IEP.

Keywords: Assistive Technology, Disabilities, SETT Framework, WATI, Quality Indicators of AT

Introduction

Assistive technology (AT) is a general term describing tools that are used to maintain or improve the functional abilities of a learner with a disability in all aspects of life. AT ranges from low-tech devices that require little training and do not have complex features (e.g., magnifying glasses, large print text, or crutches) to more advanced items like hearing aids, and high-tech devices or equipment such as a communication devices and specialized computer software (Ahmad, 2015).According to the*Individuals with Disabilities Education Improvement Act*(IDEA) of 2004, an AT device is any equipment or system, purchased off the shelf commercially, customized, or specifically modified, to improve or maintain the functional capability of individuals with disabilities. Recently, AT has become an even more indispensable aid for individuals with different types and levels of disability because it increases students' access to the curriculum and improves the outcomes of the learning process (Adebisi, Liman, &Longpoe, 2015). Apart from enhancing academic achievement in

mathematics, spelling, writing, and reading, AT assists students in daily living by ameliorating social acceptance, improving organization, and enabling independence (Beyer & Perry, 2013). This highlights the importance of AT as learning technologies to facilitate flexible learning in school settings.

Accessibility and Decision-Making Regarding AT

AT and accessible instructional materials are making a significant difference in the lives of many students with disabilities, expanding their learning opportunities. The main reason for providing AT in schools is to enable students to achieve their academic goals. (Witte, Steel, Gupta, Ramos, & Roentgen, 2018). However, it is a worldwide challenge to develop policies, provision, and procedures that influence the availability, accessibility, and selection of affordable high-quality AT for the individuals who need it.

Many current laws and regulations determine decisions regarding access to education through the use of AT for learners with disabilities. The IDEA became law in 2004, mandating equity and excellence in education for individuals with disabilities (Mittler, 2007). The regulations state that all public agencies, including schools, are responsible for ensuring that AT devices and services are provided for individuals with disabilities as a part of special education, related services, or supplementary aids (IDEA, 2004). Since the IDEA 2004 defines an AT device as a piece of equipment that enhances and maintains the functional capabilities of a child (Mittler, 2007), it should be documented. If the Individualized Education Program (IEP) team determines that a student needs a certain AT to receive free appropriate public education, the school is obliged to purchase it. The word *needs*was replaced with the word *requires* in the IDEA of 1997 so that more children would be able to more accurately access AT services and devices (IDEA, 2004).

The Every Student Succeeds Act (ESSA) is another law that concentrates on technology-related interventions to enable better learning outcomes for students with disabilities. In particular, the ESSA provides for the incorporation of technology and resources in teaching and learning processes, with special emphasis on children with disabilities (ESSA, 2015). Additionally, the previous iteration of ESSA, that is, theNo Child Left Behind (NCLB) Act underlines the necessity of meeting the educational needs of all children, including those with disabilities, and defines the conditions under which segregation and inclusion may occur (NCLB, 2001). Therefore, children who need AT in order to participate in testing must be provided with it in order to have access to the standard curriculum. The Act encourages states to develop, disseminate, and promote the use of AT in

order to increase the number of students with disabilities who are tested (NCLB, 2001). This carries forward to the ESSA as well.

The right of individuals with disabilities to benefit from AT is protected also by the Assistive Technology (AT) Act which provides federal funding to each state in order to promote the access of individuals of all ages with disabilities to AT devices and services, so that individuals can more fully participate in daily activities and education. The AT Act urges states to provide direct help to individuals with disabilities so as to ensure their access to the technologies they need (Bausch, Mittler, Hasselbring, & Cross, 2005).The AT Act provides *birth to death* legislation and is basically different from other special education law, such as the IDEA, which focuses only on children, since the AT Act is intended to impact everyone, child or adult, who has a disability. Furthermore, the Act defines as eligible anybody who has disabilities that can be *enabled* by an AT device or service to "minimize deterioration in functioning, to maintain a level of functioning, or to achieve a greater level of functioning in any major life activity" (Bausch et al., 2005, p. 59).

Facilitation of the use of AT devices and services is another challenge that affects accessibility and decision-making for students with disabilities in the field of AT. Even though all children can benefit from the use of technology, only approximately 40% of students use the high-tech AT (Silman, Yaratan, &Karanfiller, 2017). School administrators and community members are responsible forproviding suitable AT services in schools. In particular, in school workshops, teachers and students with disabilities could benefit from learning more about how to choose and use of AT services. This would decrease the rate of technology abandonment driven by the inappropriate use of AT or choice of the wrong device (Judge, 2000). Silman et al. (2017) remarked that teachers, administrators, and students use AT services to facilitate administrative and teaching processes. These researchers added that the use of AT services is impacted by training and the availability of resources, both of which influence decision-making regarding the use of, and access to, AT.

The theoretical study of disabilities and special education has raised awareness about the importance of AT in facilitating access to AT services. In 1978, Vygotsky developed his social constructivist theory of learning, in which he first introduced the concept of the zone of proximal development (ZPD). In his argument, Vygotsky (1978) described learning as an essential and conventional process that allows individuals to improve mental functions and culture. Specifically, Vygotsky asserted that social interactions coupled with structured learning in the aspect of the ZPD drive cognitive development. An important concept of ZPD differentiates what children can be done independently and what they can achieve with the

help of skillful tutors. According to the theory, AT gives individuals with disabilitiesopportunities to be actively involved in an environment for knowledge acquisition, with due consideration of their learning abilities.

Developed by Vygotsky and Leontiev (1978), cultural-historical-activity theory (CHAT) "addresses human activities as they relate to artifacts and shared practices"(p.47), thus emphasizing that learning is not an isolated process. In particular, CHAT focuses on the central tenet of AT: that individuals who experience barriers to learning should be placed in a suitable context and given appropriate tools (such as AT devices and services) in order to enable interaction with resources and build learning experience (Engeström, 1987). The theory also highlights that learning works in conjunction with the environment and tools that promote the acquisition of knowledge and skills.

Understanding AT in Schools

Nowadays, general education classrooms include diverse students, some of whom have disabilities. This creates the need for teachers to move toward flexible teaching methods and materials and, in particular, AT. The incorporation of appropriate technology can help to keep students with disabilities involved in learning. Among factors that promoteunderstanding of AT in schools, it is important to highlight teachers' positive attitudes toward the usefulness of AT. If teachers appreciate the use of AT, they are more willing to incorporate available AT services and devices in the teaching process and receive training on how to best use them (Boot, Owuor, Dinsmore, &Maclachlan, 2018). If teachers are positive about their professional development regarding AT, they may be interested in the successful implementation of AT services in their classrooms.

Other factors that contribute to the understanding AT in schools are accessibility and availability of appropriate AT products, trainers, and fiscal resources in order to achieve student learning goals. The implementation of AT requires knowledge about essential resources and prudent monitoring to ensure effective decisions and enhanced quality of outcomes. Moreover, optimal use of available resources requires a comprehensive understanding of the learning needs of both educators and students(Reed, 2007). Odden, Archibald, Fermanich, and Gallagher (2002) hold that an effective decision concerning the use of resources ensures equity and prioritization in the allocation of resources, leading to the achievement of expected outcomes among educators and students. It is the responsibility of school administrators to prepare both students and teachers for the different approaches in utilizing AT before integrating such technology into the standard curriculum (Hwang, Shadiev, Kuo, & Chen, 2012). In fact, available AT resources, such as the Wisconsin

Assistive Technology Initiative (WATI), assist school teams in developing and expanding their knowledge about AT (Reed, 2007).

Even though the use of AT can be a potential aid for supporting the educational needs of students with disabilities, there are certain barriers that detract from the understanding of AT in schools. In particular, teachers' negative attitudes to AT, and lack of awareness and readiness to use these technologies, result in the poor use of available resources. In a recent study investigating teachers' knowledge and use of AT, only 25% of respondents reported that they were ready to integrate AT in the teaching process (Alkahtani, 2013). This means that, even if AT is available in school settings, its use can be hindered by teachers who do not feel ready to use these technologies.

Lack of training for teachers can also be considered as a factor that detracts from the understanding of AT in schools (Baxter, Enderby, Evans, & Judge, 2011). According to a recent survey studying teachers' perceptions of AT in helping learners with disabilities, educational leaders think that lack of access to working devices, dated technology, lack of training, and limited time to learn are major obstacles to the use of AT (Alkahtani, 2013). Additionally, Bausch and Ault (2008) stated that 41% of teachers lack training and knowledge about the use of AT in classrooms. If teachers are poorly prepared to provide AT services for children with disabilities in their schools, the special needs of such students will not be met to the fullest possible extent.

A lack of technical support and resources can hinder the understanding of AT. There is a need for technical support in order to effectively implement adequate technology in the classroom.Instructors may not have the capacity to solve technology-related issues without effective technical support. Technical challenges, such as slow internet connections, computer malfunctions, and outdated computers are major barriers for instructors (Rohaan,Taconis, &Jochems, 2009). According to Scheeler, Congdon, &Stansbery (2010), technical obstacles hinder the delivery of content and the natural flow of classroom activities, discouraging teachers from implementing technology in their instructional activities. Hence, teachers' negative attitudes, lack of teacher training, and lack of technical support and resources are key barriers to implementation and are causes of technology abandonment. This speaks of the growing need for school administrators to ensure that teachers have sufficient knowledge and skills to use AT effectively in the classroom.

Evidence-Based Practices in Implementing AT

An understanding of AT is necessary for an effective AT program for students with disabilities, though implementing AT is also critical for effective outcomes (Bausch & Ault,

2008). Implementation of evidence-based practices should be preceded by reliable research with carefully determined dependent variables. The Council for Exceptional Children (CEC; 2014) identified two types of research methods in special education: experimental group comparison methods and single-subject experimental methods. The study design must meet all quality indicators, including " context and setting, participants, intervention agents, description of practices, implementation fidelity, internal validity, outcome measures, and data analysis" (p.1).

The demand for evidence-based practices in AT decision-making is frequently articulated by administrators, researchers, and educational leaders, mainly because the legislative influences mentioned above, and the CEC's professional standers, call on special education teachers to use evidence-based practices in classrooms settings (Peterson-Karlan&Parette, 2007). Failure to use evidence-based training methods has been identified as a factor in the nonuse or abandonment of AT (Dunst, Trivette, Hamby, &Simkus, 2013). Furthermore, in the implementation of evidence-based practices, education professionals experience challenges relating to adoption, accessibility, effectiveness, and sustainability of implementing interventions (Peterson-Karlan&Parette, 2007).

Particular evidence-based practices that have been found to be most effective for the promotion of the use of AT include six characteristics. Planning, application, and detailed understanding are the main attributes of evidence-based practices in the implementation of AT. Planning entails the process of (a) introducing novel practices, materials, and knowledge to learners, as well as (b) demonstrating how educators and instructors use them in teaching. Application constitutes the way learners (a) integrate and incorporate novel practices, materials, and knowledge in their learning process and (b) the assessment of learning outcomes. Detailed understanding comprises of the process of (a) involving learners in (a) the reflecting of their experience and (b) undertaking self-assessment to explore new learning opportunities (Dunst &Trivette, 2011).

The IEP team is responsible for considering AT services for all students with disabilities and for documenting any AT needs in alearner's lEP. When the IEP team identifies a need for AT and selects specific AT services, it develops a plan for AT implementation. It is suggested that AT specialists assist the IEP team with consideration, assessment, and development of this plan (Dyal, Carpenter, & Wright, 2009). Nevertheless, since the provision of educational services has not gained the expected attention in line with the roles of AT, teams of IEP experience considerable struggles in implementation. A significant proportion of education professionals do not have adequate training to provide

quality AT services to learners. Evidence-based practices are limited due to the lack of randomized controlled experiments performed among a representative number of students with disabilities under AT interventions. Consequently, the adoption and implementation of AT in community settings and learning institutions rely on the accuracy and reliability of data provided by researchers and developers in predicting learning outcomes and benefits(Peterson-Karlan&Parette, 2007).

Therefore, some associations and tools were developed by a nationwide group in order to assist educational leaders with AT implementation. One of these associations is Quality Indicators for Assistive Technology(QIAT): a community that was established in 1998 to guide schools and teaching staff in providing high-quality AT services and devices for improving the educational achievement of children with disabilities. The indicators were validated by Zabala's doctoral research in 2004. Members of QIAT identify, disseminate, and implement a set of quality indicators for AT services in school settings that address consideration and assessment of the need for AT, including " AT in the IEP, implementing and evaluating the use of AT, transitioning to AT, administrative support for AT services, and professional development and training in AT" (The QIAT Community, 2006, p.1).

Quality indicators for developing a plan for AT implementation require AT implementation to follow a collaborative approach for all stakeholders to make their contributions. According to IEP, the development approach obliges AT team to cooperate in formulating an action plan, operationalizing activities, and defining specific roles. Clearly defined action plans for AT implementation include gathering the student information, choosing which member will be a point of contact, and determining the implementation team, equipment, and tasks. The next step is AT training, which is a service that should be delivered to students and their families, as well as teachers and any other individuals who are involved with the student. The subsequent steps are classroom and home implementation, considering the goals that are to be achieved using AT. The final step involves monitoring and evaluation of results based on the student's progress (The QIAT Community, 2012).

Another association, which began in 1993, is the Wisconsin Assistive Technology Initiative (WATI). This was a statewide system change project, the primary goal of which is to assist schools in building their capacities to provide AT devices and services to children with disabilities (Lahm & Mendonca, 2008). Numerous resources were created by the WATI team in order to help education teams to assess a student's need for AT by defining roles and responsibilities, planning the process, and conducting trials with AT (WATI, 2004). Special attention has been paid to a wide range of devices in the AT continuum, such as AT for

writing, communication, reading, studying, mathematics, vision, hearing, seating, and mobility.

WATI offers useful training manuals for teaching staff and parents, explaining a variety of ways to use AT. The comprehensive guide assists school administrators and teachers in AT decision-making within specific areas of concern (such as reading, communication, and studying) and subsequent identification of environmental considerations, tasks to be undertaken, and sensory considerations. Moreover, solutions for the selection of tools and strategies are proposed, in addition to an implementation plan for the chosen AT. WATI guidelines allow teachers to focus on areas of need and thus differentiate instruction in accordance with students' potential and abilities (Wong, 2018). Also, the WATI process provides documentation to enable teachers to record evidence and track students' progress.

Finally, the Student, Environment, Task, and Tools (SETT) Framework is a four-part model that was designed to help the IEP team in the process of gathering information about the students with disabilities' needs, abilities, and interests; the environments in which the students live and learn; the tasks to be accomplished; active participation in the learning processes; and tools such as devices, services, strategies, training, accommodations and modifications that can be used to foster the educational success of students with disabilities (Zabala, 2005). This is crucial to accurately understand students' needs and match their strengths to the environment, and tasks required.

Even though the given model helps to simplify the collection and classification of information and promotes decision-making from assessment to evaluation of outcomes, there are some serious sections that must be included: shared knowledge of the student, the environments, and the tasks; collaboration and communication of multiple perspectives between individuals who will be involved in the decision making and those who will be impacted by the decisions; information pertinent to decision making; flexibility and patience; and on-going processes for periodically revisiting the SETT Framework. These elements are critical because they aid education professionals to whether the information that applied in decision making and implementation is valid, reliable, and updated to capture the shared knowledge of AT(Zabala, Bowser, & Korsten, 2005).

The short-term impacts of using the concepts of WATI, QIAT, and SETT include facilitated AT decision making and AT implementation that consider predefined procedures and forms. The implementation forms ensure that the unique features associated with AT implementation are addressed and it is clear for which tasks each member of a team is responsible. When all information is organized simply, a team's ability to effectively generate

a range of AT that can be used to support learner achievement, competence, confidence, and independence is greatly enhanced. Long-term impacts include providing qualified support to children with disabilities regarding their regular needs-assessment, and appropriate and detailed assessment of AT in order to ensure that the selected AT is suitable and produces the intended results. They also address many of the obstacles that lead to abandonment or under-implementation of AT(Zabala,2005).

Incorporating AT in Schools

Implementation of AT can support and enhance the potential of individuals with disabilities and help them to achieve learning goals and independently perform different tasks. (Lersilp, 2016). Incorporation of AT accommodations in learning environments promotes inclusion, which considers that every child is unique and, thus, has individual needs and characteristics that should be respected (Sadao& Robinson, 2011). AT devices and services act, not only as educational tools, but as fundamental work tools that can enhance, maintain, and develop the abilities of children with disabilities so that they can access information in the same way as learners without disabilities (Adebisi et al., 2015). As a result, AT benefits children with disabilities by improving not only their academic scores but also their social skills and independence.

Mainstreaming AT helps to develop awareness of the main ideas of Universal Design for Learning (UDL), which is a framework of principles that guide curriculum development and foundational access. UDL assumes the uniqueness of learners' abilities and tries to provide equal access to learning through alternate forms of communication. AT aids students with disabilities by improving their access to the standard curriculum and overall learning outcomes. The use of AT devices and services enables teachers to give differentiated instructions to learners in accordance with their needs and abilities (Alkahtani, 2013).

Alhough the benefits of AT are clear, the reality of funding shortages and accessibility seems to be rather frustrating, both for professionals and for the parents of children with disabilities (Judge, 2000). Currently, school districts have a responsibility to make AT devices and services available to students who need them in order to benefit from the educational program. Therefore, a lot of administrators create special budgets for AT services and devices. However, IDEA 2004 does not prevent schools from seeking funding from other sources. In particular, there are state grants that allow some of the costs of AT equipment to be defrayed. Also, federal grants are available, although they require the school administration team to spend a great deal of time preparing the grant application (WATI,

2004). Some schools may obtain funds from local community organizations that realize the importance of AT services in education.

It is crucial that teaching staff be adequately trained in order to provide support to children with disabilities who use AT services and devices in the learning environment (Alper&Raharinirina, 2006). Different studies have pointed to the need for teachers to be trained on integrating and implementing AT in general classrooms. Alkahtani (2013) found that over 75% of the 127 special education teachers surveyed were inadequately prepared, while 18% said they were not at all prepared, to offer AT services to the students. Less than 2% of the surveyed teachers said that they were sufficiently prepared and 85% of the surveyed teachers had an interest in pursuing professional development in AT. Additionally, with regard to inclusion, students should be offered new technological services, but the lack of teachers' knowledge of how to use them is a major barrier to the use of AT. Because of the positive effects of AT on students with disabilities, many schools hire professional trainers to ensure that teachers and students have adequate skills and knowledge to use AT services and devices (Parette, Peterson-Karlan, & Wojcik, 2005). Other researchers recommend including an advanced course on the use of AT in the training curriculum (Silman et al, 2017). This would enable teachers to make children with disabilities better users of AT.

It should be stated that, first of all, AT services help students with disabilities to access information to enhance their learning both at school and in daily life. AT helps someone do something they could not do otherwise without the AT. Effective incorporation and use of AT in the education of students with disabilities is impossible without teachers' support. In particular, it is clear that positive teacher attitudes increase students' participation in educational activities and help such students to develop independence and gain access to various learning environments. According to Browder, Wood, Thompson, and Ribuffo (2014), AT applications could influence the implementation of educational strategies and enable the process of teaching and learning in the classroom to be more effective. However, a high percentage of teachers think that students with disabilities should function without AT, because the use of technologies negatively affects their skill development. Some teachers believe that the use of AT slows the learning process for the class (Alkahtani, 2013). This speaks of the need to educate teachers about the importance of AT in order to raise their awareness of the positive influences of such services on children with disabilities.

Recommendations for the Implementation of AT

Lack of funding for AT products and their high cost are considered to be common obstacles to AT implementation in schools (Boot et al., 2018). It is suggested that the main remedies for these barriers involve decreased costs and an increase in funding possibilities. In particular, schools should consider applying for federal or state grants for AT programs that are aimed at supporting students with disabilities.For low- and middle-income countries where indirect costs, the cost of maintenance, and access to appropriate AT devices are a challenge, borrowing expensive devices from other schools may be considered. Other efforts to increase the accessibility and affordability of AT include community-based approaches and asking non-profit and faith-based organizations to assist with the supply of AT devices. However, these solutions are short-term ones and can only be applied in the context of a particular school, meaning that the issue should be considered on a state level.

Lack of awareness about AT is another major and widespread barrier, not only for special education educators, but for all teaching staff (Boot et al., 2018). Parents of children with disabilities lack the confidence or knowledge to use AT; in particular, learning how to use AT devices is reported to be a particular challenge. Even though parents mainly agree on the usefulness of AT devices, they often express concern about how to better utilize and maintain these products (Baxter et al., 2011). Therefore, in order to raise awareness about using AT, teachers, parents, and students with disabilities should be provided with adequate training with the support of an AT specialist. This would enable all the key stakeholders to acquire useful skills and knowledge regarding the AT device. School administrators can hold workshops for teachers and parents to be instructed about using AT according to evidence-based strategies and practices.

Practitioners and classroom teachers may be aware of the positive influence of ATbut have little experience in integrating AT in a learning environment. Lack of a professional needs assessment is a key challenge that often results in the selection of inappropriate AT devices, their poor implementation resulting in children gaining no benefit from the technology. To address such a challenge, it is suggested that teachers pay attention to guidelines written by educational teams (such as WATI and QIAT) that aim to assist teachers in assessing a child's need for AT and further planning of AT integration (Wong, 2018). There are also content-rich websites that provide information on low-tech and high-tech AT and can help teachers with AT implementation.

Teachers' negative perceptions about integrating children with disabilities into the standard curriculum is a major barrier, not only to AT implementation, but also to inclusive

and equal learning and UDL principles (Lahm & Mendonca, 2008). In order to change teachers' negative attitudes, the teaching staff should be educated about the benefits of AT, thus enabling the empowerment of children with disabilities to be increased. It has been found that training opportunities can influence teachers' beliefs about AT and how AT can improve the educational potential of children with disabilities (Dunst &Trivette, 2011). This would enable teachers to recognize AT as a facilitator of the academic success of such children.

Conclusion

This paper specifies and highlights how laws, regulations, resources, district practices, and theoretical understanding of disability and special education influence accessibility and decision-making regarding students with disabilities in the area of AT. AT has a significant importance in students' achievement and independence; many studies have focused on the use of technology to assist teaching by examining the teachers' role and acquiring information and knowledge about the students' role. This paper focuses on how AT helps to overcome the barriers that hinder improved student performance and access. It also considers evidence-based practices for implementing AT, because teachers who are properly prepared are better able to give guidance on the best devices and software or programs available and their suitability for the coursework they teach. Thus, with AT, students can have equal access in ways that without AT, they would be denied the same opportunities; AT is crucial in the lives of individuals with disabilities.

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