African Journal of Emerging Issues
Peer reviewed | Double blind | Interdisciplinary

African Journal of Emerging Issues
(AJOEI)
Online ISSN: 2663 - 9335
Available at: https://ajoeijournals.org

EDUCATION

ASSISTIVE TECHNOLOGY INTEGRATION FOR CHILDREN WITH SPECIFIC LEARNING DISABILITIES: A SYSTEMATIC LITERATURE REVIEW PERSPECTIVE FROM MEXICO

Francisco S. Miguel

Universidad de las Américas Puebla (UDLAP)

E-mail of the Corresponding author: miguelfranc.s@gmail.com

ABSTRACT

An important resource for children with learning disabilities to flourish in the classroom is access to assistive technology. To prepare children on how to utilize assistive technology in the learning environment is important for teachers. According to the Individuals with Disability Education Act (IDEA), any equipment that is used to improve functional capabilities of individuals with disabilities is considered as AT. It may include any software program, or product system that is used to increase, maintain, or improve the functional capabilities of people with disabilities. By implementing assistive technology as an integration to school curriculum, the educators can assist children with special needs by providing remedies to solve specific learning problems and can promote independent learning. The emergence of special education in the sense of educating abnormal students emerged during the first stage and is closely related to the principle of mandatory education. By the end of the 19th and the beginning of the 20th centuries the idea of mandatory and universal elementary education gained momentum in Mexico. The implementation of such education revealed that there were many abnormal children who required a special pedagogy. It is at this time that the government took charge of the institutions where children with mental, visual, and auditory impairments had been rehabilitated and treated with the support of private and public welfare and transformed them into educational environments. With technology, an individual physically unable to speak can communicate with spoken language. Using a portable voice synthesizer, a student can ask and respond to questions in the regular classroom, overcoming a physical obstacle that may have forced placement in a special segregated classroom or required a full-time instructional aide or interpreter to provide a voice. Technology is providing more powerful and efficient tools to teachers who work with children with disabilities. To enhance the delivery of special education services, the Mexican National Public Education Secretariat developed two systems: support service units for regular schools and multiple attention centers. Support service units for regular schools. Support service units are designed to provide adaptations to curricula on the basis of the context and characteristics of the communities in which the schools are located.

Keywords: *Assistive, Technology, Integration, Specific, Learning, Disabilities, Systematic*

1.1 BACKGROUND

Much of the technology we see daily was developed initially to assist persons with disabilities (Gowran, Clifford, Gallagher, McKee, O'Regan & McKay, 2020). Curb cuts at street corners and curb slopes, originally designed to accommodate people with orthopedic disabilities, are used more frequently by families with strollers or individuals with grocery carts than by persons with wheelchairs or walkers. The optical character reader, developed to assist individuals unable to read written text, has been adapted in the workplace to scan printed documents into computer-based editable material, saving enormous amounts of data entry labor (Gowran, et al., 2020). Technology can be a great equalizer for individuals with disabilities that might prevent full participation in school, work, and the community. This is most evident in the case of individuals with mobility, hearing, or vision impairments, but is also true for individuals with limitations in cognition and perception (Maloney, Freeman & Wohn, 2020). With technology, an individual physically unable to speak can communicate with spoken language. Using a portable voice synthesizer, a student can ask and respond to questions in the regular classroom, overcoming a physical obstacle that may have forced placement in a special segregated classroom or required a full-time instructional aide or interpreter to provide a voice.

Technology is providing more powerful and efficient tools to teachers who work with children with disabilities (Al-Dababneh & Al-Zboon, 2020). These tools enable teachers to offer new and more effective means of learning while individualizing instruction to the broad range of student learning needs. According to Siyam and Abdallah (2021), educators are using computers as tools to deliver and facilitate learning beyond drill and practice, to provide environments that accommodate learning, and to ensure enhanced and equitable learning environments to all students. Access to the World Wide Web, email, listservs, and other electronic learning environments is common in many classrooms. In these environments, students around the world can interact in real time via onscreen messaging or video and audio transmissions. In most of these learning situations, a disability makes no difference at all (Tang, Abuhmaid, Olaimat, Oudat, Aldhaeebi & Bamanger, 2020).

The definition of assistive technology applied to education is extremely broad, encompassing 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 (Pritchard, English & Ravenscroft, 2021). As a result, the potential range of AT devices is incredibly large, and both high-tech and low-tech devices are included. High-tech devices may be computers, electronic equipment, or software. Although electronically operated, high-tech devices need not be expensive, a simple low-cost switch that controls a battery-operated toy can be considered a high-tech device, as can a tape recorder. Low-tech devices are manually, not electronically, operated. This group includes devices such as pencil grips, mouth sticks, and mechanical hoists. It is critical to understand the implications of this definition to comprehend its effect on children with disabilities in our schools. It is fairly easy to understand how the definition is applied with regard to children with physical or sensory disabilities. To see a young child who had been unable to speak for her first five years say her first sentence with a speaking computer device presents an exciting and clear picture of assistive technology (Mutia & Cahyani, 2021). The benefit of AT is also easy to comprehend when a child who cannot hear can understand his teacher's directions because real-time captioning converts the teacher's speech to text projected onto his laptop computer (Mutia & Cahyani, 2021).

According to the UNICEF (2019) report, up to ten percent of children in the world have affected specific learning disabilities (SLD) and the majority of these children are educated in general education classrooms. An important resource for children with learning disabilities to flourish in the classroom is access to assistive technology. To prepare children on how to utilize assistive technology in the learning environment is important for teachers. According to the Individuals with Disability Education Act (IDEA), any equipment that is used to improve functional capabilities of individuals with disabilities is considered as AT (Atanga, Jones, Krueger & Lu, 2020). It may include any software program, or product system that is used to increase, maintain, or improve the functional capabilities of people with disabilities (Kumar & Raja, 2010). By implementing assistive technology as an integration to school curriculum, the educators can assist children with special needs by providing remedies to solve specific learning problems and can promote independent learning. However, the selection, acquisition and use of AT depends up on the evaluation of the needs of the child and the adequate level of the professionals, who work students with learning disabilities (Campbell, et.al, 2016).

To facilitate learning opportunities for children with SLD, teachers should use appropriate teaching strategies and materials to reduce or eliminate children's deficits in specific learning areas. The major responsibility of a teacher is to provide children with successful learning experiences regardless of their disabilities, in order to reach their goal for a brilliant future (Kumar & Raja, 2010). Therefore the teachers should use suitable technological devices for these students and ascertain how, with whom, where and when these devices can be provided most effectively. They might have the knowledge about teaching methods and how to design the curriculum according to student's needs, which are the key components of children's academic success (Netherton & Deal, 2017). However, inadequate information and insufficient pedagogical strategies on how to integrate the assistive technology into the ordinary curriculum is still an anxiety among teachers.

The majority of children with specific learning disabilities have problems in reading, which is known as dyslexia (Miciak & Fletcher, 2020). It normally affects the children's ability to recognize and manipulate the sounds in language as well as problems with decoding and recognizing new words. Children who suffer from this problem have difficulty with learning to read accurately and fluently. Writing difficulty (dysgraphia) is another problematic academic area for students with learning disabilities. Children with dysgraphia have difficulties in organizing and expressing their thoughts and ideas in written form. It impacts the basic writing skills of handwriting, typing and spelling. Another learning disability is the problem unique in remembering and correctly applying the steps in mathematical problems (dyscalculia). Specific problems may include difficulty in understanding size and spatial relationships, concepts related to direction, place value, decimals, fractions, time and remembering mathematical facts (Dhana, &Jagawat, 2019). Given the worldwide trend toward the integration of children with special needs into the general school system, and the Program for Educational Modernization (1989-1994) in Mexico, Mexican educators have had to reassess the politics of special education, focusing on different service delivery models. One model, Integrated Groups, which has been functioning since the 1970s and is primarily for children with learning and language disabilities, is described. New legislation recently enacted recognizes and encourages the collaboration of general education and special education to meet the needs of all children.

2.1 SPECIAL EDUCATION IN MEXICO

Special education in Mexico evolved into four stages; the first one, from 1867 to 1970, was based on an welfare model with a medical perspective; the second stage, during the 1970s characterized

by the emergence of public institutions still with a medical and rehabilitation approach; the third stage, during the 1980s, was characterized by a psychogenetic and psychoeducational model; and the fourth stage, which began in the 1990s is based on the integration/inclusive model (Vasquez, 2021). The emergence of special education in the sense of educating abnormal students emerged during the first stage and is closely related to the principle of mandatory education. By the end of the 19th and the beginning of the 20th centuries the idea of mandatory and universal elementary education gained momentum in Mexico. The implementation of such education revealed that there were many abnormal children who required a special pedagogy. It is at this time that the government took charge of the institutions where children with mental, visual, and auditory impairments had been rehabilitated and treated with the support of private and public welfare and transformed them into educational environments. According to Padilla (2018), special education emerged as a consequence of mandatory education in the country.

The idea of special education as a different or specific form of pedagogy in Mexico, which characterized the second stage, emerged as a consequence of various international congresses where it was argued that children with disabilities could learn (Amaral, 2021). The educational approaches first embraced had a strong medical influence, as physicians were involved in diagnosing and defining, along with teachers, the abilities that children had to learn. Several national congresses were organized where it was argued that special education schools were necessary to serve students with other types of disabilities, such as the so called imbeciles and "juvenile delinquents. Some of the most important schools created during this phase, which are still functioning, are the Behavior Clinic (Clı´nica de la Conducta) founded in 1937 to serve students with behavioral problems, the Ortholalia Clinic (Clı´nica de Ortolalia) founded in 1952 to serve students with speech and language problems, and the Institute for the Rehabilitation of Blind and Short-sighted Children (Instituto para la Rehabilitacio´n de los Nin˜os Ciegos y De´biles Visuales) founded in 1952.

The challenges of meeting the requirements of students with special needs under the Individuals with Disabilities Education Act and other laws are a particularly timely topic, as large numbers of native Spanish-speaking students move into the United States (Tohara, 2021). Against that backdrop, this article reviews the laws for special education in Mexico and the United States. The focus on the laws in Mexico stems from the fact that many students cross the border daily to attend public schools in the United States, and because Mexico has many laws in place dealing with special education. We offer school district leaders a comparative overview of the laws in our two countries, so they can be better prepared to meet the needs of the students they serve.

Article 39 of the General Law of Education declares that the Mexican national education system comprises general, special, and adult education. Article 41 authorizes the integration of young learners with special educational needs into mainstream classes through the application of necessary methods, techniques, and materials. If integration is infeasible, the law calls for the implementation of alternative programs. Article 41 also stipulates that special-education services must include the orientation of parents or guardians, educators, and special-education personnel involved in the process of integrating special-education pupils into mainstream society. According to Article 27 of the law of the National Institute for the Evaluation of Education, the institute is responsible for designing and implementing evaluations contributing to the quality of learning, giving special importance to regional groups and cultural and linguistic minorities, as well as to individuals with disabilities.

To enhance the delivery of special education services, the Mexican National Public Education Secretariat developed two systems: support service units for regular schools and multiple attention centers. Support service units for regular schools. Support service units are designed to provide adaptations to curricula on the basis of the context and characteristics of the communities in which the schools are located. Units must be located in schools and are designed to provide human, technical, methodological, and conceptual support focusing on inclusive classes, and eliminating or at least minimizing barriers to learning. In 2013, the Mexican government initiated the General Guidelines for Special Education Services within the Framework of Inclusive Education established with the purpose of guaranteeing educational equity and the betterment of the existing special-education processes and results. In a manner similar to the IDEA's Part B regulations, the guidelines promote the regulation of special education and the alignment of the different agents that contribute to that process. The guidelines focus mainly on the diagnosis of students with disabilities, the planning necessary for their academic success, and the evaluation of their progress and readiness to proceed to more advanced levels of education.

Education is a dynamic field in both the United States and in Mexico. One of the issues that have come up within this field is the merging of special education and regular education in order to provide an "inclusive education for all." This trend, which is currently taking place in both countries, began in the United States with Public Law 94142 (Choate 1993). The law, known as the Education for All Handicapped Children Act, was enacted in 1975. In Mexico, regular education and special education were, for several decades, two clearly separated entities. On 15 June 1993 a new general education law, which is in many ways similar in content and meaning to PL 94-142, came into effect. This law deals, among other things, with two important issues; the decentralization of education and educational integration. It appears, then, that in Mexico the recognition of diverse characteristics and educational needs of children, as well as the merging of special education with regular education in search of an inclusive education, have started only recently. These changes are raising challenging issues that need close attention and prompt action. One of these issues relates to educational outcomes and their relation to expectations, which in turn have a close connection to identification, diagnostic procedures, and intervention strategies. The objectives and educational decisions made by this central organ were uniform for all children and were to be equally applied throughout the entire nation. The principle behind this policy was to provide equal educational opportunities for all Mexican children. Identical teaching principles and identical materials were used regardless of location, population characteristics, ethnic and cultural backgrounds and values, and regional particularities. To ensure uniformity, a single set of free textbooks for elementary education was published by the board of education and distributed to every child nationwide (Villa 1988).

3.1 Literature Review

According to Lin (2021), for students who are blind or visually impaired, many devices such as Google Chromebooks come with audiovisual assistance. For example, Chromebooks have a built-in screen reader called ChromeVox, which reads content out loud for users on the Chrome browser. Chromebooks also have features that make on-screen content easier to read, such as screen magnifiers, high-contrast mode and select-to-speak. Teachers can also plug in or pair a Braille keyboard with Bluetooth if students need Braille support. Popular cloud-based applications such as G Suite for Education and Microsoft Office 365 also have dictation capabilities, allowing students to type by using their voice. For students with learning, cognitive and developmental disabilities: Besides creating VR experiences for students with autism, tools such as memory aids,

audio books and text-to-speech systems are especially helpful for students who need assistance with learning, attention and organization. One particular tool is Microsoft's Immersive Reader, which was specifically designed to support students with dyslexia and dysgraphia. With the Immersive Reader, students can have text read out loud and broken into syllables — even in other languages. Microsoft's Tell Me feature allows students to access commands on Office 365 applications without having to remember them. There are also downloadable fonts such as OpenDyslexic, which can enhance readability and reading speed for students with dyslexia, Ball says. Plus, there are handy smart tools such as the Livescribe Echo Smartpen, which acts as an all-in-one microphone, speaker and storage device.

According to Teng and Zhang (2020), Students with learning disabilities in writing often do not see themselves as writers. Due to previous failed attempts, many of these students feel enough anxiety about writing to do everything they can to avoid the task. Obviously, this avoidance results in less practice (Zhang, 2019). Montgomery and Marks (2016) summarized the frequently seen limitations in the writing of students with learning disabilities. These students display avoidance behaviors, do not approach the writing process with an organizational plan, create writing with multiple spelling and grammatical errors, use limited vocabulary, write fewer words than their peers, do not make writing revisions, and produce products that cannot be read. Assistive technology is designed to address these issues. Assistive technology impacts instruction for students with writing learning disabilities. Zhang (2019) suggested that assistive technology provides some of the needed assistance that students with special needs require while they are mainstreamed into general education classrooms due to the prompting of No Child Left Behind. Assistive technology can provide access to the general education curriculum for students with learning disabilities. They help the learner by offloading some of the writing task onto the machine, facilitating the use of detail and organization, editing written work, and generating motivation.

Englert et al. (2015) also noted the effects of offloading some of the cognitive work onto the computer. They noted research that stated that assistive technology can reduce cognitive demands by making the text structure visible. By supplying an organizational framework, the computer functions as a partner in the writing process for students with disabilities by prompting cognitive resources to generate, sequence, and arrange information to fit the demands of a writing purpose. They found that the writing tools and text structure strategies enabled students with learning disabilities to be more likely to include related details and organization. Organizational quality was improved, but the text length was unaffected. Englert et al. (2017) researched the effects of using the organization assistive technology, TELE-Web. TELE-Web's features include reminders to generate introductory statements and prepare readers for what is coming next. It also reminds the student to write evidence and supportive details and concluding sentences. The results of their research using TELE-Web suggest that the writing tools and text structure strategies available within the program increase the chances that the writers would have better organization quality and story structure. This particular study also found that text length was affected

Reding and Eaton (2020) indicate that variety of accessible technology, the sophistication, its dynamism, and the decisions to select the types of technology that would meet the needs of children with learning disabilities pose various questions on its usage, adaptability and availability. At the moment, much information do exist on all issues related to the choice, accessibility and purchase of any piece of technology; but much of the information is, nonetheless, of varying degrees of affordability and readability, especially in the developing or third world countries, which requires the expertise and necessary skills to use them on children with disabilities.

Therefore, in today's learning environments, a wide range of technologies are creating new options for making a distinction in instruction and supporting the participation of all children, including children with learning disabilities. Learners and professionals need to be informed on the importance of providing learners with learning disabilities with the technology tools they need in order to be successful learners.

As indicated by Slegers, Kouwenberg, Loučova and Daniels (2020), Assistive Technology (AT) is capable of addressing many types of learning difficulties. Higgins and Raskind (2000) stated that a child who has difficulty writing can compose a school report by dictating it and having it converted to text by special software. Moreso, a child who struggles with arithmetic problem can use a hand-held calculator to keep score while playing a game with a friend. Also, a teenager with dyslexia may benefit from AT that will read aloud from the textbook guide. A child who cannot speak may need a communication device such as a language board or a device with a speech synthesizer to participate in class. Additionally, a child with a learning disability may need a computer programmes to learn to read. AT has usually been applied to computer hardware and software and electronic tools. The AT tools help children with learning disabilities, who struggle with listening, mathematics, organization and memory, reading and writing skills. Each of the skills is listed and how AT could help to solve the learning skills.

4.1 KEY DISCUSSION AND CONCLUSION

With technology, an individual physically unable to speak can communicate with spoken language. Using a portable voice synthesizer, a student can ask and respond to questions in the regular classroom, overcoming a physical obstacle that may have forced placement in a special segregated classroom or required a full-time instructional aide or interpreter to provide a voice. Technology is providing more powerful and efficient tools to teachers who work with children with disabilities. These tools enable teachers to offer new and more effective means of learning while individualizing instruction to the broad range of student learning needs. Educators are using computers as tools to deliver and facilitate learning beyond drill and practice, to provide environments that accommodate learning, and to ensure enhanced and equitable learning environments to all students.

Up to 10 percent of children in the world have affected specific learning disabilities (SLD) and the majority of these children are educated in general education classrooms. An important resource for children with learning disabilities to flourish in the classroom is access to assistive technology. To prepare children on how to utilize assistive technology in the learning environment is important for teachers. According to the Individuals with Disability Education Act (IDEA), any equipment that is used to improve functional capabilities of individuals with disabilities is considered as AT. The emergence of special education in the sense of educating abnormal students emerged during the first stage and is closely related to the principle of mandatory education. By the end of the 19th and the beginning of the 20th centuries the idea of mandatory and universal elementary education gained momentum in Mexico. The implementation of such education revealed that there were many abnormal children who required a special pedagogy.

To enhance the delivery of special education services, the Mexican National Public Education Secretariat developed two systems: support service units for regular schools and multiple attention centers. Support service units for regular schools. Support service units are designed to provide adaptations to curricula on the basis of the context and characteristics of the communities in which the schools are located. Units must be located in schools and are designed to provide human,

technical, methodological, and conceptual support focusing on inclusive classes, and eliminating or at least minimizing barriers to learning. In Mexico the recognition of diverse characteristics and educational needs of children, as well as the merging of special education with regular education in search of an inclusive education, have started only recently.

REFERENCES

Al-Dababneh, K. A., & Al-Zboon, E. K. (2020). Using assistive technologies in the curriculum of children with specific learning disabilities served in inclusion settings: teachers' beliefs and professionalism. *Disability and Rehabilitation: Assistive Technology*, 1-11.

Amaral, L. (2021). AA framework for designing pedagogical materials in Indigenous languages: examples from Brazil and Mexico. *Tellus (UCDB)*, 145-166.

Atanga, C., Jones, B. A., Krueger, L. E., & Lu, S. (2020). Teachers of students with learning disabilities: Assistive technology knowledge, perceptions, interests, and barriers. *Journal of Special Education Technology*, *35*(4), 236-248.

Gowran, R. J., Clifford, A., Gallagher, A., McKee, J., O'Regan, B., & McKay, E. A. (2020). Wheelchair and seating assistive technology provision: a gateway to freedom. *Disability and Rehabilitation*, 1-12.

Lin, Y. K. M. (2021). *Exploring Relationships Between the Technology Identified in Local Control and Accountability Plans and Student Achievement Measures on the Caaspp in the County of Los Angeles* (Doctoral dissertation, Azusa Pacific University).

Maloney, D., Freeman, G., & Wohn, D. Y. (2020). " Talking without a Voice" Understanding Non-verbal Communication in Social Virtual Reality. *Proceedings of the ACM on Human-Computer Interaction*, *4*(CSCW2), 1-25.

Miciak, J., & Fletcher, J. M. (2020). The critical role of instructional response for identifying dyslexia and other learning disabilities. *Journal of Learning Disabilities*, *53*(5), 343-353.

Mutia, F., & Cahyani, I. R. (2021). Assistive Technology to Enhance Access to Information for Student with Disabilities: A Case Study in Surabaya. *Khizanah al-Hikmah: Jurnal Ilmu Perpustakaan, Informasi, dan Kearsipan*, *9*(1), 16-27.

Pritchard, D., English, A. R., & Ravenscroft, J. (2021). Extended cognition, assistive technology and education. *Synthese*, 1-23.

Reding, D. F., & Eaton, J. (2020). *Science and Technology Trends 2020 2040: Exploring the S and T Edge*. NATO S and T Organization.

Siyam, N., & Abdallah, S. (2021). A Pilot Study Investigating the Use of Mobile Technology for Coordinating Educational Plans in Inclusive Settings. *Journal of Special Education Technology*, 01626434211033581.

Slegers, K., Kouwenberg, K., Loučova, T., & Daniels, R. (2020, April). Makers in healthcare: The role of occupational therapists in the Design of Diy Assistive Technology. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (pp. 1-11).

Tang, T., Abuhmaid, A. M., Olaimat, M., Oudat, D. M., Aldhaeebi, M., & Bamanger, E. (2020). Efficiency of flipped classroom with online-based teaching under COVID-19. *Interactive Learning Environments*, 1-12.

Teng, L. S., & Zhang, L. J. (2020). Empowering learners in the second/foreign language classroom: Can self-regulated learning strategies-based writing instruction make a difference?. *Journal of Second Language Writing*, *48*, 100701.

Tohara, A. J. T. (2021). Exploring Digital Literacy Strategies for Students with Special Educational Needs in the Digital Age. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, *12*(9), 3345-3358.

Vasquez, P. L. (2021). *Secondary Administrators' Sense of Self-Efficacy and the Impact on Fronterizo Special Education Students in the Southwest Borderland: A Mixed Methods Study* (Doctoral dissertation, New Mexico State University).