



El uso de tecnología de asistencia para enseñar inglés a estudiantes con autismo

The use of Assistive Technology to teach English to students with Autism

O uso de Tecnologia Assistiva para ensinar Inglês a alunos com Autismo

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Resumen

Este estudio de caso de método mixto tiene como objetivo principal proporcionar información sobre la implementación de la aplicación Pixton como tecnología de apoyo en una intervención individualizada en el proceso de enseñanza y aprendizaje del inglés para un estudiante diagnosticado con trastorno del espectro autista (TEA). El participante en el estudio, J., un estudiante de 14 años que asiste a clases regulares en una escuela privada en Guayaquil, ha tenido TEA desde su nacimiento. El estudio consistió en la implementación de un plan de tres semanas. Esta intervención incluyó adaptaciones en la clase de inglés que exigían el refuerzo de habilidades receptivas (escuchar y leer) para luego mostrar su producción escrita a través de la aplicación Pixton. Este proceso formativo se midió mediante una hoja de observación, una entrevista y una encuesta a lo largo de tres semanas. En general, los resultados mostraron mejoras en indicadores como la memoria ampliada, el buen comportamiento y el aprendizaje seguro, mientras que otros permanecieron iguales. Parte de las limitaciones encontradas durante la implementación estaban relacionadas con la comunicación en sí con el estudiante y sus compañeros, y el costo de adquirir las herramientas consideradas para este estudio. Esta intervención ofrece una nueva perspectiva en escenarios ecuatorianos con respecto a intervenciones individuales relacionadas con la educación inclusiva.

Palabras Clave: Trastorno del Espectro Autista; Tecnología Asistida; Clase de inglés, Intervención Individual.

Abstract

This mixed method case study has the main objective of providing information on the implementation of the Pixton application as an assistive technology in an individualized intervention in the English teaching and learning process for a student diagnosed with autism spectrum disorder (ASD). The participant in the study, J., a 14-year-old student who attends regular classes at a private school in Guayaquil, has had ASD since he was born. The study consisted of the implementation of a three-week plan. This intervention included adaptations in the English class that required the reinforcement of receptive skills (listening and reading) and then showing their written production through the Pixton application. This training process was measured through an observation sheet, an interview and a survey over three weeks. Overall, results showed improvements in indicators such as extended memory, good behavior and safe learning, while

others remained the same. Part of the limitations found during the implementation were related to the communication itself with the student and her classmates, and the cost of acquiring the tools considered for this study. This intervention offers a new perspective in Ecuadorian settings regarding individual interventions related to inclusive education.

Keywords: Autism Spectrum Disorder; Assisted Technology; English class, Individual Intervention.

Resumo

Este estudo de caso de método misto tem como objetivo principal fornecer informações sobre a implementação do aplicativo Pixton como tecnologia assistiva em uma intervenção individualizada no processo de ensino e aprendizagem de inglês para um aluno com diagnóstico de transtorno do espectro do autismo (TEA). O participante do estudo, J., um estudante de 14 anos que frequenta aulas regulares em uma escola particular de Guayaquil, tem TEA desde o nascimento. O estudo consistiu na implementação de um plano de três semanas. Esta intervenção incluiu adaptações na aula de inglês que exigiram o reforço das habilidades receptivas (compreensão auditiva e leitura) e posteriormente a exibição de sua produção escrita por meio do aplicativo Pixton. Este processo de formação foi medido através de uma ficha de observação, uma entrevista e um inquérito ao longo de três semanas. No geral, os resultados mostraram melhorias em indicadores como memória estendida, bom comportamento e aprendizagem segura, enquanto outros permaneceram os mesmos. Parte das limitações encontradas durante a implementação estiveram relacionadas à própria comunicação com o aluno e seus pares, e ao custo de aquisição das ferramentas consideradas para este estudo. Esta intervenção oferece uma nova perspectiva nos cenários equatorianos em relação às intervenções individuais relacionadas com a educação inclusiva.

Palavras-chave: Transtorno do Espectro Autista; Tecnologia Assistida; Aula de Inglês, Intervenção Individual.

Introduction

The current context in the education of children with autism spectrum disorder (ASD) concerning learning the English language is influenced by the social environment and the socio-demographic level within a family atmosphere that generates greater emotional difficulties and fewer psychosocial behaviors. In this situation, these children present a real challenge in learning English

because they are generally absorbed in their inner world and seem to live in a private atmosphere, within which they have limited ability to communicate and interact with society.

This case study pertains to J., a 14-year-old teenager attending 9th grade at a private school in Guayaquil, Ecuador. The school follows the Montessori methodology, which, among its main parameters, incorporates the constructivist approach into formal education. Joshua has a modified curriculum at a 3rd-grade level in subjects such as Spanish and English: language and literature, mathematics, language arts, world history, science, management, social studies, and natural sciences.

J. was diagnosed with autism spectrum disorder (ASD), ranging from mild to moderate, at an early age. He demonstrates limited spontaneous language and encounters difficulties in sustaining a fluent conversation. He is introverted, easily isolating himself while his peers engage in group activities. During school leisure time, breaks, and social events, he noticeably withdraws with a discernible negative demeanor.

Like J., there is a percentage of children with this disorder in Ecuador. Therefore, this study presents assistive technology as an effective alternative for learning and teaching the English language, considering that English is spoken in many countries around the world and is a useful tool for job opportunities. According to the Ministry of Public Health, Ecuador has approximately 1600 people with autism, including 160 children. They are characterized by difficulties in following instructions, interacting with other children of their age in classrooms, communication and social interaction problems, and repetitive behaviors, known as autism spectrum disorder (ASD).

The World Health Organization states that children with Autism are born this way because their brain development was interrupted during the fetal stage, caused by genetic effects that regulate how neurons communicate with each other. These factors lead to autism spectrum disorder (ASD), which in turn generates difficulties in school learning, especially in learning the English language. It is important to address this issue because Autism is spreading nationally and globally, and the public needs to be increasingly informed about how this neurodevelopmental disorder mainly affects social interaction areas, communication skills, and cognitive functions.

Can assistive technology then be a solution to improve English in children? How much does it affect children with autism not being at the level of their peers for proper English language learning? Assistive technology aligns with the institutional interests of primary and secondary

education, as it would be part of the programs or curricular reforms implemented by the Ministry of Education for schools and colleges, with the purpose of improving the learning of the English language in autistic children and as part of special education. As the focus or objective of this research is to provide the outcomes of implementing Pixton app in the English language teaching and learning process for a student diagnosed with autism spectrum disorder (ASD). Pixton app is an online tool for creating creative characters and comics. This tool is useful to create stories and enhance writing assignments. However, a drawback of this application is that a monthly subscription fee must be paid for its use in school-age children. It also works on written expression and enhances imagination. It includes illustrated panels with or without text that, when read in sequence, compose a story. This way, intervening the linguistic progress, pronunciation, retention, and communication, identifying what hinders their learning, analyzing the level of comprehension, and proposing new policies that were part of the discussion to prove its benefits.

This is a case study that involves collecting information, investigating, reflecting, and expanding knowledge (Creswell, 2012). Additionally, tools such as surveys, interviews and observation sheets will be utilized to have a more concrete idea and specific results, aiming to thoroughly analyze the progress or lack thereof in the applied methods. Therefore, with this proposal, children with this disorder will benefit immediately and directly, as the results of their learning will be seen in each class with their teachers and parents. The teacher will exert less effort compared to the significant effort they currently put into trying to make them learn at the same level as others through traditional and regular education. Similarly, parents will benefit from their children's English language learning. I will carry out this project in a private school in the city of Guayaquil, Ecuador, specifically with an autistic student in the ninth year. I present this new project as a useful and much-needed alternative in the formal education of the country, with a significant social impact on the academic formation of children and adolescents, so that they are not excluded or sidelined from the learning processes that are part of the educational system of the country. These assistive technologies should be included in the curricular reforms of the Ministry of Education, based on the situations exposed in this study and, in this case, in the subject of English. Considering that the number of autistic individuals in the country is increasing. According to the World Health Organization (2023) one out of every 100 children born autistic, and as of now, there is no known cure or medication for their treatment.

LITERATURE REVIEW

Children with Autism

The American Psychiatric Association (2013) classifies autism spectrum disorder (ASD) as a neurodevelopmental disorder. These disorders are more frequently visible before the child enters school and present impairments of personal, academic, or social interaction. These disorders can also co-occur; for example, people with ASD often have intellectual developmental disorders. Therefore, the deficit in general mental abilities: problem solving, planning, judgment, learning from experience, and others, affect to meet standards of autonomy and social participation in different community scenarios. A visible trait related to communication disorders comprise language disorders and speech disorders that are generated in the repetition of sounds or syllables with excessive physical effort. Likewise, this neurodevelopmental disorder begins early in life and causes lifelong impairment.

This association (2013) also states certain diagnosis criteria related to deficit in socioemotional aspects like unusual social patterns and the inability to engage in normal back-and-forth conversations. Another deficit is present in nonverbal communication behaviors that provoke poor integration of verbal and nonverbal communication; variations in eye contact and body language or impairments in understanding and use gestures. Finally, there are also deficits in understanding or maintaining relationships such as sharing imaginative play or making friends or the lack of interest in peers.

Part of these diagnostic criteria comprises identifying limited patterns of behavior or attitudes that are visible in certain factors: first, repetitive use of motor actions, objects, or speech. Second, inflexibility in following routines of verbal or non-verbal behavior. Third, intensity in fascination with unusual objects. Finally, hypersensitivity to sensory input (e.g. negative response to specific sounds or textures, excessive smell, hypersensitivity to light or movement)

The American Psychiatric Association (2013) classifies (ASD) in three severity levels. The second level is the one that is characterized by requiring substantial support. Regarding Social communication, this level comprises deficiencies in verbal and non-verbal social communication skills; significant social impairment even with support; and limited initiation. An autistic person at this level is limited to narrow special interests and their non-verbal communication is distinctly strange. Besides, restricted and repetitive behaviors show inflexibility with change or other repetitive habits. This behavior interferes with functioning in a variety of situations.

Current theories try to explain autistic differences. However, the Weak Central Coherence (WCC), proposed by Frith in 1989, explains the advantage associated with attention to detail in people with autism. This suggests that people with autism may focus on details, literal thinking (i.e. "black and white" thinking) and have difficulty gathering information to process the overall meaning. However, research has found that some people with autism are able to see the "big picture" rather than focusing on the details. Using these skills in functional tasks shows their strengths. In addition, WCC theory is associated with strong visual processing. People with autism spectrum disorders can present a large amount of information visually compared to other formats.

However, studies of WCC in groups of children and adults with ASD have yielded conflicting results. Although researchers have shown that participants with ASD perform better than individuals without ASD on visual processing tasks that require detailed processing of information (Siegel, Minshew, & Goldstein, 1996), other studies have shown no differences between ASD participants and controls on these tasks (Ozonov, Pennington and Rogers, 1991).

Certain studies regarding the acquisition of languages show meaningful insights regarding autistic children in an English language class. Batool et.al. (2022) studied the potential benefits of scaffolding language learning in two autistic children and its impact on the acquisition of lexical concepts. The results showed that visual experiences, such as the use of videos and pictures, help children with autism learn nouns; however, there is some difficulty in learning verbs. The study also suggests the expansion of research into other elements of language, such as morphemes and grammatical categories, to investigate the effectiveness of scaffolding instruction in these areas for children with autism.

On the same manner, (Hays, 2022)s (2022) also reveals the challenges faced by children with autism in their English vocabulary learning journey. His research showed that each child with autism has his own learning materials, unique learning goals, and different cognitive abilities, which make it difficult to measure his progress. These insights reveal the need to adapt the instruction to the specific needs of the autistic child in the English classes to succeed. Moreover, the non-social language acquisition in autism is the processing of material outside of spoken language development and that the manipulation of non-linguistically embedded and connected material may be the application of innate mechanisms to non-standardized material (Mottron et. al., 2021)

Assistive Technology

Lang et. al (2014) describe assistive technology as using any device or piece of equipment that supports users to learn new skills, improve the existing ones, or reduce the effect of a disability on daily basis. Assistive technologies designed to provide alternative forms of communication (speech generating devices) or facilitate social initiation (tactile pager prompts) can be used to improve communication and social deficits experienced by individuals with ASD (American Psychiatric Association, 2000). Likewise, restrictive and repetitive behavior patterns and interests can be approached through technology-supported self-management strategies. Due to these characteristics, people with ASD are obvious candidates for the use of assistive technologies designed to support communication.

1. Speech-Generating Devices: Text-to-speech helps convert written text into spoken words, while speech-to-text converts spoken words into written text.
2. The Picture Exchange Communication System (PECS). PECS involves teaching the person with ASD to communicate via handing their partner a picture or symbol card depicting their communicative intent (Bondy and Frost, 2002).
3. Computer-Based Instruction. Recent advances in technology have increased the versatility and reduced the financial cost of computers.

In their study, Drigas and Pergantis (2023) analyzed the neurobiology of stress and ASD and investigated the relationship between AT, stress, and anxiety in individuals with ASD. The article highlights significant research gaps in the use of AT to combat stress and anxiety, as well as challenges in integrating promising options into the daily lives of people with autism spectrum disorders. Likewise, Zuraida and Mohamed (2023) highlighted the need for mobile application-based assistive technology to consider Malaysian cultural norms in teaching social skills to children with autism spectrum disorder (ASD). The paper highlights the importance of locally culturally sensitive materials in assistive technology to support the adoption of technology-based learning strategies and improve understanding of social skills in Malaysia.

Ariana Zainal Abidin (2022) explains that the learning process prioritizes the use of virtual actions for students, and according to virtual research, it has been concluded that students using this technological tool increase motivation, creativity, and improve student learning outcomes, the knowledge that has so far been insufficient. This helps the visual aspect of students regarding this

article because through what they perceive visually, it will be easier for the teacher to guide them, and they can better understand the learning of the English (Lang, 2014)uage.

Suksela (2022) explains that in this video-based learning method, the teacher acts as a guide and facilitator who directs students to find concepts, arguments, procedures, algorithms, and the like, with three main characteristics: exploring and solving problems to create, combine, and generalize documents and activities to integrate new knowledge with existing knowledge.

In this visual method, students experience the process of completing tasks on their own, achieving internal satisfaction in being able to do something independently with the guidance of the teacher. This increases the desire to make more discoveries, ensuring that the learning process does not stagnate and progresses smoothly and effectively. This method, widely used during the pandemic, motivates them to create a pleasant learning environment regardless of their physical surroundings, and helps them develop communication skills in line with their limitations. By discovering concepts on their own, the meaning they find can be transferred to other situations, and through video strategies, they will develop cognitive, emotional, and psychomotor skills.

Considering that autism is a developmental disorder that affects normal learning and includes symptoms such as difficulty communicating with others, repetitive behaviors, and sensory sensitivity, it is necessary to raise awareness of it, seeking alternative ways of teaching and learning through the Pixon tool. Within this application, it is necessary to create classrooms and add students, which can be done through Clever, Google, or Microsoft options, or using usernames, accessible through an email and username. With these two options, an avatar is created and sent to students through a link. Teachers may decide which option is best to implement with their students.

METHODOLOGY

This case study had a mixed-method design, with a participatory experimental design. Norman (2005), a renowned author, suggests that participatory design should focus on the individual, not solely relying on previous work in a linear structure. Instead, it should plan according to the person, considering strengths and weaknesses, and emphasizing the person's experience. Therefore, designing products or systems should consider the capabilities and limitations of each person.

The study group consisted of an autistic student and two English language teachers, one of them was the researcher of this study. This study was conducted over a period of three weeks.

Data Collection Instruments:

For this intervention, the researcher created a three-week plan with the development of these three instruments: the interview, the observation sheet, and a survey. This invention consisted of differentiated lesson plans to apply them in the student's English class. These lesson plans were revised and validated by the Counseling Department of the school.

The researcher interviewed the autistic student to understand their perception related to cognitive learning, behavior, and social interaction, which were the dimensions considered. This interview comprised ten questions, each of them with four options represented by facial expressions: frustrated, happy, sad, and fearful, so that the student could easily answer them.

The researcher also implemented an observation sheet to measure teacher's management improvement, visual help, and learning technological tool, as the dimensions considered to measure assisted technology with a Likert scale.

In addition, a survey was administered to the English language teacher with the purpose of getting to know the challenges of interacting with an autistic profile in class.

After analyzing and interpreting the initial diagnosis, the researcher organized an intervention plan in the English class.

Each day's plan included three parts: warm-up, build-up, and wrap-up. The warm-up involved presenting the topic through video or flashcards based on assistive technology. In the build-up, the teacher explained the tasks for the student to use assisted technology. In the wrap-up, the student implemented his ideas based on what they learned, consolidating their knowledge with a worksheet.

These classes were conducted 80% in English and 20% in Spanish during this intervention time. Specific vocabulary, questions, and scenarios related to the chosen theme or the institution's curriculum were explained on days 1-4. On the fifth day of Week one, the student was requested to create a short story with dialogues using five figures (slides).

The second week followed the same methodology of explaining vocabulary, creating, and consolidating knowledge. The researcher focused on creating an advertising announcement to raise funds, using themes taught in the first week. Specific questions like *what is it? Who is it? How could? What could?* were crucial for intervention development.

On the third week, the same methodology was applied but with a change in applying learned concepts to real-life situations involving the autistic student. The goal was to ensure that he could effectively communicate his ideas in a written and precise manner.

RESULTS

The following tables show the insights recorded in the observation sheet that the researcher used during the intervention. Each table comprises the indicators considered for the observation and the accuracy the student showed during the intervention.

Table 1.

Observation Sheet

INDICATORS	PERCENTAGES (ACCURACY) PER WEEK			
	WEEK 1	WEEK 2	WEEK 3	Mean
Solving Problems	0-25 %	0-25 %	0-25 %	25%
Improves Interaction	0-25 %	0-25 %	26-50 %	25%
Concentration	0-25 %	26-50 %	26-50 %	50%
Safe Learning	26-50 %	26-50 %	51-75%	50%
Memory Expanded	26-50 %	26-50 %	51-75%	25%
Improve Soft Skills	0-25 %	0-25 %	26-50 %	25%
Understand Commands Easily	26-50 %	26-50 %	51-75%	50%
Self-regulation	0-25 %	26-50 %	26-50 %	50%
Increased Communication Abilities	26-50 %	26-50 %	26-50 %	50%
Maintaining A Good Mood	26-50 %	26-50 %	51-75%	50%

Note: Elaborated by Fernando Moreno and Martha Castillo

The present observation sheet is based on a study conducted over three weeks, indicating the following: regarding problem-solving, for weeks 1, 2, and 3, it was observed that the student maintained the same learning percentage, i.e., from 0 to 25%. Regarding improved interaction, for the first two weeks, it remained in the range of 0.25%, and in the third evaluation week, it increased from 26% to 50% in the advanced percentage. Learning indicators such as confidence, expanded memory, improved soft skills, enhanced communication skills, and maintaining a good sense of

humor obtained the highest evaluation percentage during the three assessment weeks, ranging from 26% to 50% in learning or effectiveness. On the other hand, soft skills indicators remained in the 0 to 25% range in the first two weeks and increased to 26% to 50% in the third week. Given the short evaluation period, it is important to note that none of the indicators reached 100%.

The researcher interviewed the autistic student regarding his perception towards his perception of his interaction within the English classes. Since the student lacked speaking skills due to his condition, a behavior chart was created to help him identify himself with the behavior codes (happy, sad, fear and frustrated).

Regarding his positive mood towards the English class, the autistic student responded that he felt *happy* when he does not put so much effort to remember things, using a computer or smartphone for his classes.

On the other hand, he manifested feeling *sad* in certain moments in class, like doing any playing activity where other classmates are involved in, when someone is ordering or giving him any instruction related to classes, or something that he cannot do or complete. Regarding his feelings of *fear*, the student responded that being agitated is not good, and when someone new teaches him. Finally, he responded feeling *frustrated* when he needs to be concentrated in English class, the necessity of talking with somebody else and he shows frustration when he expresses better communicative skills.

The researcher chose to interview the teacher of the autistic child to gain detailed insights into the student's development, behavior, and educational needs. Direct interaction provides valuable contextual information for better understanding the school environment and tailoring specific interventions.

Table 2

Ranking Problem Solving from 1 to 4.

A.- Communication Skills	4
B.-Social Interaction	4
C.- Sensory Issues	3

D.- Daily Routines and Transitions	2
E.- Behavioral Challenges	2

Note: Elaborated by Fernando Moreno and Martha Castillo

The teacher considered A, B as the most challenging to manage in the English class regarding her interaction with the autistic student. Also, she considered C, D and E as the least challenging.

Table 3

Ranking Gaining Knowledge from 1 - 4

A.- Reading Skills	4
B.-Math Skills	4
C.- Retaining Information	1
D.- Learning New Concepts	4
E.- Focus and Attention Span	4

Note: Elaborated by Fernando Moreno and Martha Castillo

The teacher considered A, B, D and E, as the most challenging to manage in the English class regarding her interaction with the autistic student. Also, she considered C as the least challenging.

Table 4

Ranking Concentration from 1 - 4

A.- Create a Quiet and Organized Learning Environment	1
B.- Use Visual Cues and Timers to Establish Routines.	1
C.- Implement Regular Breaks and Sensory Regulation Techniques.	2
D.- Teach Self-regulation and Self-monitoring Strategies.	4

E.- Implement Task Initiation and Completion Supports.	4
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Note: Elaborated by Fernando Moreno and Martha Castillo

The teacher considered A, B, C as the least challenging to manage in the English class regarding her interaction with the autistic student. Also, she considered D, E as the most challenging.

Table 5

Ranking Understand Commands easily from 1 - 4

A.- Using Visual Supports Alongside Verbal Commands.	1
B.-Breaking Down Commands into Smaller, Sequential Steps.	1
C.- Providing Clear and Concise Instructions.	2
D.- Incorporating Visual or Gesture Cues with Commands.	1
E.- Using Repetition and Reinforcement to Reinforce Understanding.	4

Note: Elaborated by Fernando Moreno and Martha Castillo

The teacher considered A, B, C and D as the least challenging to manage in the English class regarding her interaction with the autistic student. Also, she considered E as the most challenging.

Table 6

Triangulation of participants' insights

Traits	Teacher	The Teacher- Research	The Autistic Student
Big challenge in class	<i>Social interaction.</i>	<i>Solving problems.</i>	<i>Talking and interacting with peers.</i>
Improving concentration	<i>Using visual cues and timers.</i>	<i>Shows some improvement</i>	<i>Shows some improvement</i>
Gaining knowledge in English	<i>Retaining information.</i>	<i>Shows some improvement</i>	<i>Shows some improvement</i>

Frustration towards learning	<i>Providing clear and concise instructions to avoid frustration.</i>	<i>The student constantly shows frustration with new scenarios</i>	<i>Feeling frustrated not being able to understand harder commands</i>
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Note: Elaborated by Fernando Moreno and Martha Castillo

Table 6 represents the insights of the three educational components: teacher, researcher, and student, which must be interconnected. The major challenge in the classroom arises in getting knowledge in English through receiving instructions and learning to solve problems. The autistic student exhibited slight improvement in concentration by using timers and visual cues within the Pixton app.

CONCLUSIONS AND RECOMMENDATIONS

At the end of this study, we can conclude that the use of Assistive Technologies in the English language teaching and learning process requires periodic evaluations. These assessments serve as a basis to determine the extent and percentages of the student's progress over time in knowledge, skills, expanded memory, concentration, behavior, and safe learning. Such evaluations will keep us informed about areas of greater and lesser advancement. Another valuable and necessary conclusion for the practical application of this study is to diagnose, collect, and analyze data to assess potential problems that may arise during the implementation of Assistive Technology. This involves explaining the current situation of English language teaching in autistic students, highlighting differences compared to regular students. Clear and precise instructions while engaging in playful activities is essential to prevent students from becoming frustrated with new tasks. The purpose is to obtain information about both groups, understand their abilities, and successfully initiate new learning processes. A third conclusion emphasizes the importance of teachers becoming familiar with Assistive Technology. This entails having sufficient computer knowledge, quick access to information, and the ability to see and hear other teachers. This would help in better organization, learning new things, applying technology in other areas of learning and subjects, and ensuring that all teachers are somehow connected.

Based on these conclusions, the researchers recommend implementing the use of Assistive Technology through periodic evaluations. Gathering information about the subjects' situation, their

capabilities, and anything deemed necessary is crucial for successfully initiating new learning processes. Additionally, conducting relevant diagnostics, collecting and analyzing data, and applying specific techniques are essential for gaining precise knowledge of the student's learning in English language teaching. It is advisable to involve not only teachers and professionals but also the broader society, including families, in the English language teaching and learning process for autistic children. Ensuring that families are familiar with Assistive Technology enables them to engage in the learning process at home. This allows parents to interact with the student, address doubts, and work collaboratively, thereby strengthening family bonds, enhancing communication, and increasing the productivity and efficiency of human activities. After thorough analysis, study, and practice with the student, it is recommended that the use of Assistive Technology in children and adolescents can be implemented in the curriculum updates of public and private schools in Ecuador. It should be considered as an additional and necessary learning tool in the modern education of this century, considering the technological advances that the world offers daily. Through various digital devices such as computers, cameras, machines, and mobile phones, human intelligence can be reflected in the greatest and best inventions that motivate and encourage true societal development and progress.

It is recommended that teachers familiarize themselves with literature and research related to autism and how to interact with an autistic student. Professional development related to inclusive education, self-study, and innate curiosity in teachers. (Zuraida, Juliana, Noordiana, & Ida Aryanie, 2023).

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