




ASSISTIVE TECHNOLOGIES IN INCLUSIVE EDUCATION AND THEIR APPLICABILITY FOR THE INCLUSION OF AUTISTIC STUDENTS IN SCHOOLS

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ABSTRACT

This research aimed to analyze the applicability of assistive technologies in the inclusion of autistic students in schools, investigating how these tools contribute to the improvement of educational quality and the effective participation of these students in school activities. The methodology used was qualitative and exploratory, with a sample composed of 18 education professionals selected by convenience. Data collection was carried out through in-depth interviews, and data analysis was done using the discourse analysis technique. The results indicated that assistive technologies, especially Alternative and Augmentative Communication (AAC) devices and activity organization tools, have a positive impact on communication, anxiety reduction, and the development of social skills in autistic students. However, challenges were also identified related to the training of educators, school infrastructure, and the resistance of some families to the use of these technologies. The conclusion pointed out that, although assistive technologies are effective tools, their

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successful implementation depends on the proper training of professionals, collaboration between school, family and specialists, and the improvement of infrastructure conditions in schools, to ensure full and effective inclusion of autistic students.

Keywords: Assistive Technologies. Education. Autism.



INTRODUCTION

School inclusion is a fundamental right guaranteed by the Federal Constitution of Brazil, which aims to guarantee equal opportunities for all students, regardless of their individual characteristics. In this context, inclusive education seeks to meet the diversity of learning needs, promoting a more accessible and equitable educational environment. Among the different groups that demand greater attention and support in schools, students with Autism Spectrum Disorder (ASD) stand out. These students have a wide variety of characteristics, which include difficulties in communication, social interaction and behavior, which requires an adaptation of teaching methods and the school environment so that they can have a full and effective educational experience (Braga; Silva; Pedrosa, 2021).

Assistive technologies have proven to be a fundamental tool in the process of school inclusion. They encompass a variety of features and devices that help compensate for limitations in motor, sensory, cognitive, and communicative skills. In the case of autistic students, assistive technologies can be used to facilitate communication, improve socialization and understanding of content, in addition to providing a more predictable and structured environment. The use of these technologies becomes a powerful strategy to eliminate barriers in the educational process, allowing autistic students to engage more actively and participatively in school activities (Coelho et al., 2022).

Among the most common assistive technologies are adaptive educational software, alternative and augmentative communication (AAC) devices, reading and writing support tools, and even virtual and augmented reality technologies. AAC devices, for example, are particularly useful for students with difficulties in verbal communication, allowing them to express themselves through images, symbols, or even by synthesized voice. In addition, apps and programs that help organize and predict activities can contribute to reducing anxiety in autistic students, offering a more structured and predictable environment (Costa et al., 2020).

The applicability of these technologies in inclusive education, especially for students with autism, is not limited to the use of specific tools. It involves a reconfiguration of the school environment itself, where the use of assistive technologies must be integrated into the pedagogical plan. The teacher, for example, must be trained to use these technologies effectively, adapting them to the individual needs of each student. Collaboration between the family, support professionals and the school is essential to ensure that the technologies chosen are the most appropriate and that their use is optimized in the learning process (Santos; File; Santos, 2021; Silva et al., 2022).

Thus, the objective of this research was to analyze the applicability of assistive technologies in the inclusion of autistic students in schools, investigating how these tools contribute to the improvement of educational quality and the effective participation of these students in school activities. The main types of assistive technologies used in schools and their advantages and challenges in promoting more inclusive teaching will be discussed. The research will also seek to identify the best pedagogical practices that incorporate these technologies and the impacts observed on the academic and social development of autistic students.

When considering the use of assistive technologies, it is important to understand that the inclusion of autistic students goes beyond adapting the curriculum and educational tools. It involves a continuous process of raising awareness in the school community, valuing diversity and promoting an environment of respect and welcoming. Assistive technologies, in this sense, function as a means, and not as an end in themselves, to promote equity in access to education. In this way, they must be an integral part of a broader pedagogical approach that seeks to respect differences and enhance the capacities of all students.

METHODOLOGY

This research has an exploratory character, with the aim of investigating and understanding more deeply the use of assistive technologies in the inclusion of autistic students in schools, based on the experience and perception of education professionals. The exploratory character is fundamental to identify the main practices and challenges in this field, allowing an initial analysis of the possible contributions of these technologies to school inclusion. The research aims to provide information that can support future investigations and improve educational practices aimed at this audience.

As for the approach, this research was qualitative, since the main objective was to understand the phenomenon of inclusion of autistic students through an in-depth analysis of the perceptions, attitudes and experiences of education professionals. The qualitative approach allows for a richer and more detailed understanding of the contexts and interactions that involve the use of assistive technologies, making it possible to capture the nuances and complexities of this process. This type of approach values the narratives and meanings attributed by the interviewees, instead of seeking only numerical or quantitative results (Lima; Domingues Junior; Gomes, 2023; File; Domingues Junior; Silva, 2024; Lima et al., 2024; Lima et al., 2024; File; Silva; Domingues Júnior, 2024).

The research sample was composed of 18 education professionals, including teachers, pedagogical coordinators, and specialized assistants who work directly with autistic students in schools. Participants were selected by convenience, that is, based on the availability and accessibility of professionals to participate in the research. This strategy was chosen due to factors such as limited time and resources, which made this approach more feasible for conducting the study.

Participants were invited to share their experiences and perspectives on the use of assistive technologies, offering a direct insight into the impact of this approach on inclusive education. Data collection was carried out through the application of in-depth interviews. In-depth interviews are a qualitative technique that allows you to explore the perceptions of the interviewees in a detailed and unrestricted way, allowing the respondents to freely share their experiences and points of view on the topic.

To carry out the research, an initial contact was made with the manager of the educational institution, who authorized the application of the interviews and assisted in the identification of the participating professionals. After this authorization, interviews were scheduled with the participants according to their availability. During the interviews, recorders were used to record the answers, ensuring that the data was collected accurately and faithfully. Before the beginning of the recordings, the respondents were informed about the purpose of the survey and guaranteed their consent to be recorded, ensuring transparency and respect for the ethics of the survey.

Data analysis was performed using the discourse analysis technique, an approach that allows interpreting qualitative data in a more in-depth way, identifying patterns, themes, and underlying meanings in the participants' statements. Discourse analysis is not limited to transcribing the words of the interviewees, but seeks to understand the contexts, intentions and implications of the answers. Through this technique, it was possible to identify how professionals perceive the use of assistive technologies in the education of autistic students, what are the challenges faced and which practices are considered most effective.

RESULTS AND DATA ANALYSIS

From the interviews conducted with the 18 education professionals, several aspects related to the use of assistive technologies in the inclusion of autistic students in schools were addressed, revealing both the potentialities and challenges of this practice. The data analysis allowed us to identify different dimensions of this process, such as the perception of educators about the effectiveness of these technologies, the barriers to their implementation and the impacts observed on the development of students.

The first point highlighted by the interviewees was the positive perception of the usefulness of assistive technologies. According to respondent E03, "technologies facilitate students' communication, especially those who have difficulties with speech". This statement is corroborated by E07, who emphasizes: "augmentative communication applications are indispensable, as they help to remove the communication barrier and make students express themselves more clearly". In this sense, the use of Alternative and Augmentative Communication (AAC) devices proved to be fundamental for students who have significant verbalization difficulties, allowing them to interact more easily with the school environment and with their peers.

Another important point mentioned was the positive impact of assistive technologies in reducing anxiety in autistic students. The use of software and applications to organize daily activities was pointed out as an effective strategy to create a more predictable and structured environment. According to E10, "students are calmer when they know exactly what is going to happen, which helps to reduce impulsive behaviors". The use of tools that allow you to anticipate day-to-day activities, such as visual schedules or calendar apps, was widely recognized by respondents as a way to reduce uncertainty and promote a more stable learning environment.

In addition, it was identified that assistive technologies have also contributed to the development of students' social skills. According to E05, "some augmented reality programs have been effective in training students in social situations, making them feel more comfortable in interactions with peers." The application of virtual and augmented reality has proven to be an interesting tool, as it allows students to practice social interactions in a controlled environment, without the challenges that real-world interactions can provide.

Despite the benefits observed, many interviewees highlighted the challenges related to teacher training and the integration of assistive technologies into the school curriculum. E02 stated: "It is not enough just to have the technologies, it is necessary for teachers to be trained to use them effectively". The lack of adequate training was pointed out as a significant obstacle, as many educators feel insecure about the use of new technologies. This point was corroborated by E09, who highlighted that, "although technologies are powerful tools, they only have an impact if the teacher knows how to apply them properly within the context of each student".

The infrastructure of the schools was also pointed out as a limitation. E12 reported: "In some schools, basic resources are lacking, such as quality internet and adequate devices, which makes it difficult to implement assistive technologies". This report highlights the inequality in access to technological resources between different educational

institutions, which can hinder the effective inclusion of autistic students in some regions or schools.

Another aspect that emerged in the interviews was the resistance of some families in relation to the use of assistive technologies. E06 mentioned: "Some parents do not understand that technologies can be an ally, they believe that they can replace human contact". This resistance to the adoption of new technologies, especially in the family context, can be an additional barrier to the successful implementation of these tools. This point, however, was minimized by E08, who commented: "Over time, parents realize the benefits and end up engaging more in the process."

The perception of the impact of assistive technologies on the learning of autistic students also varied. E11 stated: "Although technologies help a lot, it is important to remember that they do not replace the role of the educator", suggesting that assistive technologies should be seen as complementary to pedagogical work and not as isolated solutions. This view was reinforced by E04, who stated: "The use of technologies needs to be combined with a pedagogical approach centered on the student, considering their individualities".

Despite the difficulties, many professionals expressed optimism about the future of assistive technologies. E14 commented: "I see that the trend is for technologies to become more and more accessible and effective, helping more and more the inclusion of autistic students". This positive view is shared by E15, who stated: "Assistive technologies have great potential to transform inclusive education, especially when schools engage in this process more intensively."

Another important point identified in the interviews was the importance of collaboration between different professionals in the inclusion process. E16 stated: "The exchange between teachers, psychopedagogues and technology specialists is fundamental for assistive technologies to be used more effectively". Interprofessional collaboration was seen as a key element in ensuring that technologies meet the individual needs of each student in an integrated way.

Regarding the most effective types of assistive technologies, many professionals mentioned AAC devices, which were highlighted for their ability to facilitate communication by nonverbal learners. E17 commented, "The use of these devices can be the difference between a student who feels invisible and a student who can communicate and interact with others." In addition, adaptive educational software has also been mentioned as a useful tool to personalize learning and meet the specific needs of students.



FINAL CONSIDERATIONS

The analysis of the results of the research confirms the relevance of assistive technologies in the process of inclusion of autistic students in schools. Technological tools, especially those aimed at communication and the organization of activities, have shown great potential to improve student interaction and learning. Communication, which is often one of the biggest barriers for students with autism, can be significantly facilitated by AAC devices, allowing for greater participation in the school environment.

However, the research also showed that the effectiveness of assistive technologies depends heavily on the training of educators. The lack of adequate training and the lack of knowledge about how to integrate these tools into the school curriculum are still significant challenges. The results suggest that, for assistive technologies to be effective, it is necessary that education professionals receive specific training, in order to use these resources efficiently and consciously to the individual needs of each student.

Another important point was the issue of school infrastructure. The survey revealed that the lack of basic resources, such as quality internet and adequate devices, limits the implementation of assistive technologies in some schools, especially in the most peripheral ones. This scenario demonstrates the need for investments in infrastructure so that all schools, regardless of their location, can offer quality inclusive education.

Additionally, collaboration between education professionals, families, and technology experts is crucial for the effective implementation of assistive technologies. The research showed that the integration of different knowledge and experiences can enrich the inclusion process, ensuring that technologies are used in a complementary way to pedagogical work. This collaboration is also essential to overcome the initial resistance that often arises on the part of families and the school community.

The research also indicates that the use of assistive technologies should be seen as a tool to enhance inclusive education, and not as an isolated solution. The pedagogical approach must be student-centered, taking into account their specificities and individualities. In this way, technologies must be integrated in a personalized way, respecting the pace and needs of each student.

Finally, the results of this research reinforce the importance of continuing studies and implementing public policies aimed at training education professionals and improving infrastructure conditions in schools. Only with a comprehensive approach, which includes both professional training and access to technologies and the necessary infrastructure, will it be possible to promote full and effective inclusion for autistic students, ensuring that they have the same educational opportunities as other students.

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