RCMOS – Revista Científica Multidisciplinar O Saber. ISSN: 2675-9128. São Paulo - SP.
Ano VII, v.1 2026 | submissão: 08/09/2026 | aceito: 11/09/2026 | publicação: 14/09/2026

Assistive technology in Special Education: resources and indications

Tecnologia assistiva na Educação Especial: recursos e indicações

Tecnología de apoyo en la Educación Especial: recursos e indicaciones

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Abstract:
Assistive technology encompasses resources, strategies, methodologies, and services intended to enhance the functionality, autonomy, and participation of people with disabilities. In Special Education, its use can foster access to the curriculum, communication, reading, writing, mobility, and social interaction. This study aims to analyze the importance of assistive technology in inclusive education by identifying its main resources, educational indications, selection criteria, and challenges of application in the school environment. It is a qualitative, exploratory-descriptive bibliographic study based on Brazilian publications issued between 2022 and 2026. Articles and books related to assistive technology, Special Education, accessibility, Augmentative and Alternative Communication, and Universal Design for Learning were selected. The results indicate that screen readers, multi-format materials, accessible applications, communication systems, tactile resources, and computer-access devices can reduce different educational barriers. However, their effectiveness depends on individualized assessment, pedagogical planning, professional training, infrastructure, and continuous monitoring. It is concluded that assistive technology should be part of an inclusive educational proposal centered on each student's needs, potential, and forms of participation.

Keywords:
Accessibility. Special Education. Inclusive education. Pedagogical resources. Assistive technology.

Resumo:
A tecnologia assistiva reúne recursos, estratégias, metodologias e serviços destinados a ampliar a funcionalidade, a autonomia e a participação de pessoas com deficiência. No contexto da Educação Especial, sua utilização pode favorecer o acesso ao currículo, a comunicação, a leitura, a escrita, a mobilidade e a interação social. Este trabalho objetiva analisar a importância da tecnologia assistiva na educação inclusiva, identificando seus principais recursos, indicações educacionais, critérios de seleção e desafios de aplicação no ambiente escolar. Trata-se de uma pesquisa bibliográfica, de abordagem qualitativa e caráter exploratório-descritivo, fundamentada em publicações nacionais divulgadas entre 2022 e 2026. Foram selecionados artigos e livros relacionados à tecnologia assistiva, à Educação Especial, à acessibilidade, à Comunicação Aumentativa e Alternativa e ao Desenho Universal para Aprendizagem. Os resultados indicam que leitores de tela, materiais multiformato, aplicativos acessíveis, sistemas de comunicação, recursos táteis e dispositivos de acesso ao computador podem reduzir diferentes barreiras educacionais. Entretanto, sua efetividade depende de avaliação individualizada, planejamento pedagógico, formação profissional, infraestrutura e acompanhamento contínuo. Conclui-se que a tecnologia assistiva deve integrar uma proposta educacional inclusiva centrada nas necessidades, potencialidades e formas de participação de cada estudante.

Palavras-chave:

Acessibilidade. Educação Especial. Educação inclusiva. Recursos pedagógicos. Tecnologia assistiva.

Resumen:
La tecnología de apoyo reúne recursos, estrategias, metodologías y servicios destinados a ampliar la funcionalidad, la autonomía y la participación de las personas con discapacidad. En el contexto de la Educación Especial, su utilización puede favorecer el acceso al currículo, la comunicación, la lectura, la escritura, la movilidad y la interacción social. Este trabajo tiene como objetivo analizar la importancia de la tecnología de apoyo en la educación inclusiva, identificando sus principales recursos, indicaciones educativas, criterios de selección y desafíos de aplicación en el entorno escolar. Se trata de una investigación bibliográfica, de enfoque cualitativo y carácter exploratorio-descriptivo, fundamentada en publicaciones brasileñas divulgadas entre 2022 y 2026. Se seleccionaron artículos y libros relacionados con la tecnología de apoyo, la Educación Especial, la accesibilidad, la Comunicación Aumentativa y Alternativa y el Diseño Universal para el Aprendizaje. Los resultados indican que los lectores de pantalla, los materiales multiformato, las aplicaciones accesibles, los sistemas de comunicación, los recursos táctiles y los dispositivos de acceso al ordenador pueden reducir diferentes barreras educativas. Sin embargo, su eficacia depende de la evaluación individualizada, la planificación pedagógica, la formación profesional, la infraestructura y el seguimiento continuo. Se concluye que la tecnología de apoyo debe integrar una propuesta educativa inclusiva centrada en las necesidades, potencialidades y formas de participación de cada estudiante.

Palabras clave:
Accesibilidad. Educación Especial. Educación inclusiva. Recursos pedagógicos. Tecnología de apoyo.

1 Introduction

Special Education from an inclusive perspective seeks to ensure that students with disabilities have access to education, remain in school, and participate in curricular activities under equitable conditions. This commitment is not limited to enrollment in a regular classroom, as it requires identifying the barriers that hinder communication, mobility, understanding of content, and expression of knowledge. Conte and Habowski (2022) relate inclusion to the construction of educational experiences that welcome differences and foster collective learning. In this direction, Ribeiro et al. (2023) recognize that assistive resources can broaden students' academic and social participation.

Assistive technology plays an important role in this process because it encompasses resources, services, methodologies, and strategies capable of promoting functionality and autonomy. Its use in the educational environment may range from simple adaptations, such as pencil grips, communication boards, and tactile materials, to digital devices, screen readers, adapted keyboards, and eye-controlled systems. Araújo, Marcelino, and Martins (2025) show

that these resources can support writing, communication, learning, and leisure activities. Heidmann, Ferrão, and Guedes (2026), in turn, demonstrate that accessible digital solutions can also facilitate the teaching of specific curricular components to deaf students.

The diversity of available resources requires that their selection be related to each student's functional needs and pedagogical objectives. A sophisticated device does not become appropriate merely because it offers advanced technological features. It must be understandable, accessible, comfortable, and compatible with the tasks the student wants or needs to perform. Hummel, Domaredzki, and Costa (2025) bring assistive technology closer to planning guided by Universal Design for Learning, while Massaro and Cunha (2025) demonstrate that Augmentative and Alternative Communication can broaden the ways in which students access information, express themselves, and participate in school practices.

This study is justified by the need to understand how assistive resources can be selected and used without reducing the student to a diagnosis or turning technology into an isolated solution. Many schools face difficulties involving infrastructure, professional training, and monitoring of the equipment provided. In addition, a resource prescribed without the student's participation may be abandoned or used only at specific moments, without integration into the curriculum. Pereira, Braz, and Gonçalves (2024) identify a limited number of studies applied to the context of school Physical Education, whereas Teodoro, Rodrigues, and Baleotti (2023) find differences in professional training on the subject. Therefore, the following question is posed: how can assistive technology resources be prescribed and applied to broaden the participation and learning of Special Education students?

The general objective is to analyze the contributions of assistive technology to school inclusion, with emphasis on the available resources and their educational indications. The specific objectives are to understand the relationship among Special Education, inclusion, and accessibility; characterize the concept, importance, and population benefited by assistive technology; identify resources applicable to different needs; discuss criteria for their selection and pedagogical use; and examine challenges and possibilities in everyday school life. These purposes consider technology as part of a broader set of pedagogical and institutional actions.

Methodologically, a qualitative, exploratory, and descriptive bibliographic study was conducted. The searches considered the descriptors "assistive technology," "Special Education," "inclusive education," "accessibility," "Augmentative and Alternative Communication," "accessible pedagogical resources," and "Universal Design for Learning," used separately and in different combinations. Brazilian publications available in full, issued between 2022 and 2026, and directly related to the study objectives were included. Duplicate

materials, publications outside the time frame, texts without identified authorship, works whose complete content was unavailable, and studies that merely mentioned assistive technology without discussing its educational application were excluded. After selection, the contributions were read interpretively and organized by theme.

2 Special Education and school inclusion

Special Education is part of the right to schooling and must coordinate supports that enable students to participate in experiences developed in the regular classroom. Physical presence at school represents only one dimension of this process. Conte and Habowski (2022) understand inclusion as a practice of recognizing differences, based on coexistence and the collective construction of knowledge. Along the same lines, Pereira, Braz, and Gonçalves (2024) observe that barriers involving infrastructure, training, and pedagogical organization still limit the participation of students who comprise the Special Education population. Inclusion therefore requires changes in teaching conditions, rather than merely adapting the student to a previously established structure.

The first corresponds to the conditions that enable safe and autonomous access to spaces, information, materials, communications, and activities; the second involves belonging, interaction, learning, and participation in school decisions. Ribeiro et al. (2023) relate assistive resources to reducing obstacles faced by students with different physical, sensory, intellectual, or communicational characteristics. However, Moreira and Walter (2024) show that accessibility must consider the particular way in which each child recognizes objects, organizes references, and establishes contact with the environment. Thus, an appropriate adaptation is based not only on the category of disability, but also on observing the student's concrete forms of interaction.

Freitas, Werner, and Ceccim (2025) present the multi-format book as a means of accessing reading through combined resources, thereby broadening the experience for students with different needs. Massaro and Cunha (2025) relate this flexibility to Universal Design for Learning and Augmentative and Alternative Communication. This articulation breaks with the idea of a single activity performed in the same way by everyone. The pedagogical objective remains common, but the means of participation may vary according to the characteristics of the class.

When a student does not use oral speech functionally, the absence of a response cannot automatically be interpreted as a lack of understanding or interest. Borges and Lourenço (2023)

assign communication partners a decisive role in implementing Augmentative and Alternative Communication systems. Massaro (2026) also demonstrates that the planned use of communication supports in preschool can foster expression, interaction, and participation. This requires wait time, genuine opportunities to choose, and interlocutors prepared to recognize gestures, symbols, vocalizations, and other legitimate forms of language.

Gomes et al. (2024) identify contributions from communication systems and organizational tools to routine predictability, anxiety reduction, and the development of interactions. Lazzarini and Elias (2022) discuss the use of social stories as a support resource for understanding everyday situations. Such strategies gain value when they respond to an observed need and preserve the student's uniqueness. They should not be used to impose standardized behaviors or replace the human bond built with classmates and educators.

For deaf students, access to content depends on the presence of visual resources, Brazilian Sign Language (Libras), captions, and materials that do not subordinate all learning to oral language. Heidmann, Ferrão, and Guedes (2026) present an assistive solution for teaching Physics to this population, demonstrating that accessibility must extend across the various curricular areas. For children with visual sensory multiple disabilities, Moreira and Walter (2024) indicate the relevance of concrete objects and tactile references associated with activities. In both cases, the support must foster understanding of the content, rather than merely make the material look different.

Specialized Educational Assistance (AEE) can contribute to assessing needs, producing materials, and advising regular-class teachers. Nevertheless, responsibility for inclusion cannot be transferred exclusively to this service. Araújo, Marcelino, and Martins (2025) emphasize the contribution of multidisciplinary teams in selecting and monitoring resources for students with motor impairments. Teodoro, Rodrigues, and Baleotti (2023) show that assistive technology training involves different areas, such as mobility, accessibility, universal design, orthoses, and alternative communication. Cooperation among professionals makes it possible to combine knowledge without fragmenting the student into disconnected services.

However, the pedagogical decision must include the student whenever possible. Moreira et al. (2022) demonstrate that the production of audiovisual materials can bring communication, Special Education, and collective activities closer together. Borges and Lourenço (2023) add that family members, teachers, classmates, and other professionals can act as communication partners. This network becomes relevant when it shares information and objectives without taking away the child's or adolescent's right to make choices and express refusals.

There is no coherence in offering accessible resources during classes and withdrawing those supports when learning is assessed. Hummel, Domaredzki, and Costa (2025) advocate diversified ways of accessing content and expressing knowledge, while Massaro and Cunha (2025) associate pedagogical flexibility with the removal of barriers. Thus, the student may respond orally, use symbols, type, indicate alternatives, produce visual records, or use a communication device, provided that the instrument allows the proposed skill to be assessed.

3 Assistive technology in Special Education: concept, importance, and target audience

Assistive technology can be understood as an interdisciplinary field dedicated to expanding the functionality, autonomy, and participation of people with disabilities. It is not limited to electronic devices and does not imply high cost. Conte and Habowski (2022) relate its educational use to recognizing differences and creating conditions for shared learning. Araújo, Marcelino, and Martins (2025) include within this field resources intended for writing, communication, education, and leisure. Thus, a symbol board, a pencil support, an adapted keyboard, or reading software may serve an assistive function when it removes a concrete barrier.

A computer used by everyone to research particular content constitutes educational technology. That same equipment, when associated with a screen reader or an eye-gaze access system, assumes an assistive function for the student who depends on that support. Ribeiro et al. (2023) present different resources capable of fostering access and participation for students with disabilities. Teodoro, Rodrigues, and Baleotti (2023) demonstrate that the field encompasses alternative communication, mobility, accessibility, universal design, prostheses, orthoses, and products intended for daily activities. The purpose of use therefore helps define the assistive nature of the resource.

A person may understand a question but be unable to record the answer with a pencil; another may master certain content yet be unable to follow a video without captions or Libras. Hummel, Domaredzki, and Costa (2025) articulate assistive resources, Augmentative and Alternative Communication, and universal planning to diversify forms of access and expression. Freitas, Werner, and Ceccim (2025) show that multi-format materials also broaden the reading experience. In both cases, the adaptation does not lower pedagogical expectations, but makes it possible to demonstrate learning.

Blind students or those with low vision may use screen readers, braille displays, magnification, contrast, audio description, and tactile materials. Children with visual sensory

multiple disabilities may need objects of reference that anticipate routines and give meaning to activities, as Moreira and Walter (2024) explain. Freitas, Werner, and Ceccim (2025) add the importance of combining reading formats, sounds, images, tactile elements, and peer mediation. Selection must consider visual functionality, previous experiences, braille proficiency, and individual preferences, without applying a single solution to the entire group.

For deaf or hard-of-hearing students, accessibility may involve Libras, captions, audio transcription, light signals, and a predominantly visual organization of information. Heidmann, Ferrão, and Guedes (2026) demonstrate the possibility of developing an assistive application for teaching Physics content to deaf students. Moreira et al. (2022) also recognize the value of audiovisual materials in bringing Special Education and communication closer together. These resources must correspond to the content taught and offer good legibility and synchronization, because the mere presence of images does not guarantee understanding.

People with physical or motor disabilities may depend on postural adaptations, switches, alternative keyboards, pointers, eye tracking, or voice recognition. Araújo, Marcelino, and Martins (2025) show that computer access and eye-controlled equipment are associated with the writing and communication of children with cerebral palsy. Pereira, Braz, and Gonçalves (2024) broaden this discussion by addressing assistive strategies and products in Physical Education classes. Appropriate support should reduce unnecessary effort and enable safe participation without replacing movements the student can and wants to perform independently.

Gomes et al. (2024) relate Augmentative and Alternative Communication resources and organizational tools to improvements in the communication, predictability, and interaction of autistic students. Massaro (2026) focuses on introducing these systems in preschool, a stage in which communication opportunities influence the construction of bonds and learning. In these cases, visual and digital resources should not be used merely to control behavior; they must offer possibilities for choosing, asking, commenting, refusing, and initiating.

Students with dyslexia, persistent reading and writing difficulties, or temporary limitations may also use support resources, although this does not mean automatically classifying them as members of the Special Education population. Read-aloud tools, optical character recognition, word prediction, voice dictation, and visual reorganization of text can reduce barriers in specific tasks. Hummel, Domaredzki, and Costa (2025) support planning with multiple forms of access and expression, while Massaro and Cunha (2025) show that strategies initially intended for certain students can benefit the entire class. This expansion must preserve the distinction among accessibility, pedagogical intervention, and clinical diagnosis.

A diagnosis provides important information, but it does not by itself describe the student's performance in every school situation. Araújo, Marcelino, and Martins (2025) emphasize the need for a multidisciplinary team to understand specific demands. Borges and Lourenço (2023) add that the success of communication systems depends on preparing interlocutors. Assessment should therefore observe tasks, environments, barriers, skills, preferences, and the people involved. A resource fulfills its function only when it can be used in the real contexts in which participation occurs.

4 Assistive technology resources and their educational indications

Low-technology solutions include printed boards, routine cards, enlarged letters, slant boards, pencil adapters, grips, and objects of reference. High-technology resources include screen readers, communication applications, braille displays, eye tracking, and voice-recognition software. Araújo, Marcelino, and Martins (2025) show that the choice varies according to the writing, communication, or learning activity. Moreira and Walter (2024) reinforce that concrete and tactile materials can play a decisive role for children with visual sensory multiple disabilities. Pedagogical value therefore does not depend on price or sophistication.

Their use is indicated for people who do not speak, whose speech is difficult to understand, or who need support to communicate. Borges and Lourenço (2023) explain that teachers, family members, professionals, and classmates act as important partners in this process. Massaro (2026) adds that offering resources in preschool should create opportunities for children to initiate interactions and participate in collective experiences. The board cannot remain stored away or appear only during specialized sessions; it must accompany the student in the spaces where communication occurs.

Massaro and Cunha (2025) associate Augmentative and Alternative Communication with Universal Design for Learning because both broaden possibilities for receiving information and expressing knowledge. Hummel, Domaredzki, and Costa (2025) demonstrate that visual symbols can be incorporated into activities intended for the entire class, without restricting their use to the autistic student. This organization reduces individual exposure and makes guidance clearer. However, the system must contain broad vocabulary capable of enabling requests, refusals, comments, opinions, and questions. A set limited to routine commands restricts communicative autonomy.

For blind students, the most common resources include screen readers, braille displays, braille machines, audiobooks, oral descriptions, audio description, and raised materials. For low vision, magnifiers, digital enlargement, high contrast, appropriate lighting, and text reorganization may be indicated. Freitas, Werner, and Ceccim (2025) present multi-format reading as a possibility for combining different languages and media. Moreira and Walter (2024) draw attention to objects of reference that help anticipate and understand activities. The indication must consider whether the student primarily uses residual vision, hearing, touch, or a combination of these channels.

For deaf students, strategies include videos in Libras, captions, transcription, visual signaling, and applications that present content in sign language. Heidmann, Ferrão, and Guedes (2026) develop a resource aimed at accessibility for deaf students in Physics education, an area marked by specific conceptual vocabulary. Moreira et al. (2022) bring audiovisual production closer to education and accessible communication. These materials must observe visual clarity, translation quality, and correspondence among the displayed elements. Unreviewed automatic captions may contain errors and compromise the understanding of scientific concepts.

Motor disability may require switches, reduced or expanded keyboards, adapted mice, head pointers, wrist supports, accessible desks, voice recognition, or eye-gaze control. Araújo, Marcelino, and Martins (2025) identify eye-controlled computers as an alternative related to communication and adapted computer access as support for writing. Pereira, Braz, and Gonçalves (2024) show that assistive products can also foster participation in games, sports, and body practices. Before a resource is indicated, posture, fatigue, movement precision, safety, and the time required to complete tasks must be analyzed.

For autistic students, visual schedules, timers, social stories, communication applications, and illustrated sequences can help them understand routines and transitions. Gomes et al. (2024) associate organizational tools with predictability and reduced anxiety in school activities. Lazzarini and Elias (2022) examine the use of social stories to support understanding of contextualized situations and behaviors. These instruments must be individualized and revised as the student develops. When used rigidly, they can turn routine into a control mechanism; when used flexibly, they help anticipate changes and increase independence.

Table 1 – Assistive resources and educational indications

Observed need	**Possible resources**	**Pedagogical indication**
Access to texts by a blind student	Screen reader, braille display, and audiobook	Reading, research, and completion of written activities

Observed need	**Possible resources**	**Pedagogical indication**
Functional use of residual vision	Magnification, magnifier, contrast, and appropriate lighting	Viewing texts, images, and digital interfaces
Deaf student's linguistic access	Libras, captions, transcription, and visual materials	Understanding classes, videos, and curricular concepts
Functional speech difficulty	Board, cards, AAC application, and synthesized voice	Expressing choices, opinions, questions, and answers
Motor restriction	Switch, adapted keyboard, voice recognition, and eye tracking	Writing, digital navigation, communication, and participation in games
Need for predictability	Visual schedule, timer, and activity sequence	Organizing routines and transitions between tasks
Reading and writing difficulty	OCR, text-to-speech, dictation, and word prediction	Text access and written production
Multiple sensory disability	Objects of reference and tactile materials	Anticipation, communication, and understanding situations

Source: Prepared based on Araújo, Marcelino, and Martins (2025), Heidmann, Ferrão, and Guedes (2026), Massaro (2026), and Moreira and Walter (2024).

Hummel, Domaredzki, and Costa (2025) advocate diversifying the means of representation and response, while Freitas, Werner, and Ceccim (2025) value materials that integrate different formats. Such solutions should not perform the task for the student; they should allow the student to access the content or record knowledge through a pathway compatible with the student's functional conditions. Assessment must verify the intended learning, rather than the limitation that the resource seeks to compensate for.

Images need descriptions, videos must offer captions and Libras when necessary, documents need to be compatible with screen readers, and links must be clearly identified. Heidmann, Ferrão, and Guedes (2026) show that accessibility can be incorporated into applications focused on curricular content. Ribeiro et al. (2023) emphasize that mobile devices and accessibility software can broaden educational opportunities. However, inaccessible digital versions merely transfer to the screen the barriers present in printed material.

5 Selection and application of assistive technology in inclusive pedagogical practice

Clinical diagnosis is not sufficient to determine the resource, because people with the same condition may have different abilities, preferences, and difficulties. Araújo, Marcelino, and Martins (2025) advocate the participation of a multidisciplinary team in analyzing school demands. Teodoro, Rodrigues, and Baleotti (2023) show that the field involves knowledge of accessibility, communication, mobility, and functional performance. Observation must

consider what the student already does, which barriers are encountered, and in which environments support is needed.

It is necessary to observe how the learner positions the body, communicates choices, manipulates materials, follows explanations, and records answers. Massaro (2026) demonstrates that communication systems gain meaning when they are integrated into preschool experiences. Moreira and Walter (2024) show that objects of reference must be associated with the child's activities and experiences. Thus, testing a resource only in individual assistance may produce an incomplete impression. The classroom, playground, library, and other spaces present different demands that affect use.

If the purpose is to answer questions, the student may use symbols, an adapted keyboard, eye tracking, or an oral response. If the intention is to participate in collective reading, tactile materials, audio, magnification, or a multi-format book may be used. Hummel, Domaredzki, and Costa (2025) articulate assistive technology with flexible planning, while Freitas, Werner, and Ceccim (2025) propose accessible forms of interaction with reading. The resource should not be chosen first and only then matched to a compatible activity; the educational need must precede the technical decision.

Gomes et al. (2024, p. 8198) summarize this importance by stating that "assistive technologies have proven to be a fundamental tool in the school-inclusion process." This statement must be understood with caution: the tool becomes fundamental when there is pedagogical intent, monitoring, and the possibility of frequent use. Ribeiro et al. (2023) also recognize benefits related to participation and learning, but point to infrastructure and training obstacles. Equipment availability alone does not ensure inclusion.

Whenever possible, the student should try alternatives, express preferences, and point out discomfort. Araújo, Marcelino, and Martins (2025) relate assistive use to participation during school activities, while Conte and Habowski (2022) associate technology with recognizing differences. Ignoring the user's opinion can result in abandonment, embarrassment, or dependence. The chosen solution must be socially acceptable to the student, easy to transport, durable, and compatible with the environments the student frequents.

In the case of Augmentative and Alternative Communication, it is not enough to provide a board or install an application. Partners must learn to model the use of symbols, wait for a response, and create communication opportunities. Borges and Lourenço (2023) identify the need to train teachers, family members, classmates, and other interlocutors. Massaro and Cunha (2025) reinforce that these systems can offer multiple forms of expression. The team should avoid questions whose answers it already knows and situations in which the student merely

obeys. Functional communication includes commenting, disagreeing, refusing, asking, and initiating conversations.

Pereira, Braz, and Gonçalves (2024) show that assistive technology can extend to Physical Education and should not be restricted to literacy or specialized assistance. Heidmann, Ferrão, and Guedes (2026) demonstrate its presence in Physics education for deaf students. The broader the use, the greater the possibility that support will contribute to autonomy instead of functioning as an occasional adaptation.

Teodoro, Rodrigues, and Baleotti (2023) found differences in the course hours and assistive technology content offered by training programs. Borges and Lourenço (2023) identified a low recurrence of Brazilian programs aimed at preparing communication partners. One-off courses may introduce equipment but rarely solve implementation difficulties. Continuing education should include experimentation, practice monitoring, analysis of concrete situations, and exchange among teachers, specialized professionals, and family members.

After a resource is introduced, monitoring must assess frequency of use, autonomy, effort, comfort, quality of participation, and pedagogical results. Araújo, Marcelino, and Martins (2025) emphasize that different activities may require different technologies. Gomes et al. (2024) also associate successful implementation with collaboration among school, family, and professionals. If the resource remains stored, is rejected, or does not improve performance, the indication must be reviewed. Replacement does not represent failure, but rather part of an assessment process centered on the user's needs.

6 Challenges and possibilities for using assistive technology in the school environment

The introduction of assistive technology in schools faces obstacles related to infrastructure, training, planning, and continuity of use. Ribeiro et al. (2023) identify difficulties in accessing equipment and preparing teachers. Gomes et al. (2024) also point to limitations in internet access, devices, and training, especially in contexts with fewer resources. These factors reveal that acquiring equipment must be accompanied by maintenance, technical support, organization of use, and provision for updates. Without these conditions, potentially useful materials may remain stored or become obsolete.

Professional training is one of the main challenges. Borges and Lourenço (2023) analyzed 22 articles on training communication partners and found a predominance of international initiatives, with few Brazilian proposals in the databases consulted. Teodoro, Rodrigues, and Baleotti (2023), when examining eight Occupational Therapy programs in São

Paulo State, found differences in course hours and content. The data show that the presence of the topic in training does not guarantee uniformity or depth. Teachers and other professionals need to understand both how resources operate and how they connect with school objectives.

Table 2 – Quantitative indicators related to training and scientific production

Indicator	**Result**	**Interpretation**
Occupational Therapy programs analyzed	8	Sample examined by Teodoro, Rodrigues, and Baleotti (2023)
Programs that addressed orthoses	100%	Most recurrent content in the programs analyzed
Programs that addressed products for daily activities	75%	Present in six of the eight programs
Programs that addressed mobility, accessibility, and universal design	62.5%	Present in five of the eight programs
Programs that addressed alternative communication	50%	Present in four of the eight programs
Studies initially identified in the review on Physical Education	717	715 retrieved from the database and two included through manual search
Studies included in the review on Physical Education	7	Approximately 0.98% of the total initially identified
Included studies addressing products or resources	3	Approximately 42.9% of the final sample
Included studies addressing strategies	3	Approximately 42.9% of the final sample
Included studies addressing an instructional program	1	Approximately 14.3% of the final sample

Source: Prepared based on Teodoro, Rodrigues, and Baleotti (2023) and Pereira, Braz, and Gonçalves (2024).

Note: The percentages of 0.98%, 42.9%, and 14.3% were calculated from the figures presented by Pereira, Braz, and Gonçalves (2024).

The figures do not represent all Brazilian schools or programs, as they result from specific samples and procedures. Even so, they help reveal relevant gaps. Teodoro, Rodrigues, and Baleotti (2023) show that only 50% of the eight programs analyzed included alternative communication, despite its importance in educational and clinical contexts. Pereira, Braz, and Gonçalves (2024) found only seven relevant studies after a process that began with 717 records. The proportion of approximately 0.98% indicates that applied production at the interface between school Physical Education and assistive technology remains limited.

A resource may have technical quality and still fail to correspond to the student's needs. Araújo, Marcelino, and Martins (2025) emphasize the need to consider different activities and types of support. Moreira and Walter (2024) demonstrate that tactile references must be connected to the child's concrete experiences. When selection is based only on diagnosis, the

risk of abandonment increases. Monitoring must investigate whether the device broadens participation, reduces effort, fosters communication, and can be used safely.

Borges and Lourenço (2023) recognize teachers, family members, peers, and other agents as relevant interlocutors in implementing Augmentative and Alternative Communication. Gomes et al. (2024) relate collaboration among school, family, and specialists to the effectiveness of resources intended for autistic students. When each professional uses different symbols, commands, and strategies, the student faces systems with little predictability. A shared plan can establish common objectives, forms of support, and procedures for monitoring progress.

Attitudinal barriers persist even when equipment is available. The idea that using a resource provides an unfair advantage may lead to its withdrawal during assessments. Conte and Habowski (2022) treat technology as part of recognizing differences and constructing collective learning. Hummel, Domaredzki, and Costa (2025) show that multiple means of access and expression benefit the inclusive organization of teaching. Offering an adapted keyboard, screen reader, or communication system does not unduly facilitate the activity; it allows the intended skill to be demonstrated without interference from a secondary barrier.

Among the possibilities is the production of low-cost resources and accessible materials by educators themselves, provided that planning and assessment are present. Moreira et al. (2022) present audiovisual production as a space for partnership between education and communication. Freitas, Werner, and Ceccim (2025) show that multi-format books can combine resources to broaden reading and peer interaction. Cards, boards, tactile materials, and simple adaptations can be produced locally. However, low cost does not mean improvisation: durability, legibility, safety, and suitability for the user must be examined.

Heidmann, Ferrão, and Guedes (2026) demonstrate the development of an accessible application intended for deaf students in Physics education. Massaro and Cunha (2025) show that Augmentative and Alternative Communication resources can be integrated into proposals based on Universal Design for Learning. Applications, platforms, and mobile devices can bring together symbols, audio, video, Libras, and response alternatives. To work effectively, they must offer accessibility, data protection, compatibility with school equipment, and the possibility of use without a constant connection.

Instead of preparing an inaccessible class and adapting it afterward, the school can anticipate different ways of presenting information, engaging the class, and receiving responses. Hummel, Domaredzki, and Costa (2025) apply this perspective in a first-grade elementary class using Augmentative and Alternative Communication resources. Conte and

Habowski (2022) relate this approach to a broader understanding of inclusion. Advance planning does not eliminate individualized resources, but it reduces common barriers and prevents the student from always depending on late adaptations.

7 Final considerations

This study made it possible to understand that assistive technology has a relevant place in building a school that is accessible, participatory, and committed to everyone's learning. Its resources can foster communication, reading, writing, mobility, routine organization, access to content, and expression of knowledge. However, the mere presence of equipment does not ensure inclusion. The contribution of each solution depends on the relationship established among functional need, pedagogical objective, environment, student preferences, and the monitoring carried out by the school team.

The analysis demonstrated that responsible indication must begin by observing the tasks and barriers faced by the student, followed by trying alternatives and assessing the results. Augmentative and Alternative Communication, screen readers, multi-format materials, objects of reference, captions, Libras, computer-access devices, and accessible applications are possibilities, not fixed prescriptions associated with diagnoses. The resource must accompany changes in the student and be integrated into classes, assessments, interactions, and other school experiences.

It is concluded that implementing assistive technology requires continuing education, infrastructure, collaborative work, and participation by the user. Challenges include the unequal supply of equipment, fragile technical support, limited coordination among professionals, and insufficient applied research in certain curricular areas. Despite these limitations, accessible planning and the combination of simple and digital resources can significantly increase autonomy. Technology must act as a means of guaranteeing rights, preserving singularities, and strengthening the student's belonging to the school community.

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