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USE OF ASSISTIVE TECHNOLOGY IN SUPPORTING LEARNING OUTCOMES OF STUDENTS WITH DISABILITIES: A SYSTEMATIC REVIEW

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Abstract
The overarching objective of this literature survey is to investigate the potential of assistive technology (AT) to function as a tool in securing the learning objectives of students with special needs across various educational settings. Following the application of inclusion criteria and quality assessment tools, eleven peer-reviewed articles published from 2016 to 2025 were chosen and subsequently examined. The results reveal that AT is a major factor in raising accessibility, engagement, and academic performance of students with physical, sensory, and learning disabilities. The main devices were speech synthesis software, electronic communication aids, and e-learning platforms. There were very few benefits due to difficulties such as lack of teacher training, insufficient institutional support, and financial constraints, especially in low-resource areas. The review points to the necessity of having policies that embrace all, teacher training, and a well-developed plan that will not only take care of the present but also secure the future to be able to unlock the full educational potential of AT. The great majority of the research findings agree that assistive technology is a major factor in inclusive education and better learning outcomes if it is properly integrated into pedagogical practices.
Keywords: assistive technology, disabilities, learning outcomes, inclusive education, systematic review

1. INTRODUCTION/ LITERATURE REVIEW

Assistive technology (AT) became a major instrumental that practically changed education methodology and students with handicaps are now able to get the learning materials and activities by the new way that AT had already transformed. Different research had been done within the past few years about how it could enhance educational results, foster inclusion, and connect places with different access levels and one of them is a systematic review by McNichol et al. (2021) who affirmed that the technologically based-confident-independent-students' academic success-educational institutions' going school for inclusive education. They exemplified that AT can make the processes such as note completion, reading, and writing easier and clear for students with disabilities and, at the same time, the educational settings can fulfill their inclusion commitment obligations.

Fernández-Batañero, Montenegro-Rueda, Fernández-Cerero, and García-Martínez (2022) investigated the role of assistive devices as a strategy to integrate and involve students with special needs in a wide range of educational situations. They found that with the introduction of AT, participation became social and recruitment, hence allowing the students of the classes with physical, sensory, or cognitive challenges to have better relations forming with the faculty and co-learners. Quite significantly, their article affords that without teacher preparation, the school's readiness for the task, and the availability of the digital network, the AT alone would be of no use which is why a cohesive educational environment is mandatory if technology is to achieve its objectives.

Perlmutter, McGregor, and Gordon (2017) carried out an evidence-based meta-analysis of academic and cognitive data pointing at the positive effects of the use of AT on adolescents and adults with learning disabilities of the study group. In their review, they highlight the utility of text-to-speech software, graphic organizers, and word prediction tools that lead to improvements in reading fluency and writing accuracy.

In their most recent work, Abdelwahab, Al-Karawi, and Semri (2025) thoroughly reviewed the world's assistive technologies used for the educational, empowering, and inclusion of students with disabilities. The paper's authors argue that the progression of AI and adaptive learning software have led to the more facile and more accurate the student's needs are met. Besides, they underscored the need for setting up universal design criteria to assistive devices to make the tools less complicated, more accessible, intuitive, and user-centered, hence facilitating both academic and emotional growth.

Through meta-synthesis, Thapliyal and Ahuja (2023) examined the instructional strategies that support the use of AT for students with learning disabilities. Their study revealed that support tools yield the best results when they are used along with evidence-based instructional methods, such as differentiated instruction and formative assessment. Besides,

they emphasized that teacher beliefs and attitudes towards technology are the main factors which determine whether the assistive devices will bring instructional advances to students with disabilities.

Erdem (2017) conducted a literature review that gathers the research on students with special educational needs and the use of assistive technologies. The review ended with a statement that the use of AT encourages the students' inclusion and increases their participation in the classroom, particularly if it is done with individual educational plans. Nevertheless, the author warns that there are still gaps in access, especially in low-resource areas, where both teachers and students may not have enough training or experience with the devices and software designed for assistance.

The discussion was broadened by Lynch, Singal, and Francis (2024) to cover low- and-middle-income countries by looking into the use of educational technology for disabled learners in primary schools. They found that the implementation of assistive technology in such areas is minimal mostly due to lack of funds and inadequate policy frameworks. However, they argued that even affordable solutions like screen readers and simple communication devices could, if used inventively in inclusive classrooms, greatly enhance student involvement and their educational achievements.

Hamid et al. (2025) conducted a systematic review to unveil digital competencies and supporting technologies in the Kingdom of Saudi Arabia. They mentioned that the digital literacy of students and the teachers' knowledge of AT tools are the two most important factors for getting better learning outcomes. They found a substantial piece of evidence that when the use of AT is combined with training in digital skills, it can be a way of learner autonomy and can raise the motivation level of students, especially those with learning disabilities.

Maor, Curry, and Drewry, (2016) reviewed the research-based literature to understand the effectiveness of assistive technologies for children with special needs. Their review uncovered that, generally, AT has a great effect on the communication, literacy, and problem-solving skills of children. The author held that technologies such as speech-generating devices and interactive multimedia applications could give the power to the students to overcome their challenges in both expressive and receptive language, thus, become more active in the class and get more integrated.

SJE (2009) showed that technology to assist was a major factor in improving the learning capability of differently-abled students through increased participation and enthusiasm. The studies revealed that AT instruments, especially computer-assisted instruction, are advantageous for students with both mental and physical challenges. SJE stressed that to be successful, apart from the needed technology, a teacher's willingness for personalized teaching is also required, thus ensuring that AT is not just superficially but meaningfully integrated.

Boot et al. (2018) were concerned about the availability of the assistive device for people with intellectual disabilities. They uncovered a broad spectrum of obstacles and facilitators through their systematic review. Access barriers are mostly caused by economic factors, ignorance, and lack of support from the policy area. On the other hand, they concluded that the motivation provided by the caregivers, training of professionals, and implementation of policies at the institution level may have a great impact on the use of AT which, in turn, may result in higher educational and participatory levels for students.

The foundational synthesis by Alper and Rahrinrina (2006) surveyed a wide range of research works concerning assistive technology for the disabled, thus giving an overview of the very first changes in the field. They concluded that AT improves functional abilities and learning ability when tailored to individual needs. His work remains important in establishing the theoretical foundation for subsequent research, emphasizing collaboration between teachers, practitioners, and families in the selection and implementation of appropriate technologies.

Putri et al. (2025) divided various assistive technologies that are used for students with disabilities in higher education, by creating a framework that differentiates tools for access, participation, and performance. Their systematic review has shown that technologies that facilitate access to information, for example, screen readers and magnifiers, have the most substantial influence on academic performance. Besides, they positioned the institutional policy as a 'gatekeeper' role determining not only the standard of AT provision but also the training content and the trainers across universities in a unified way.

Stauter et al. (2019) studied the use of assistive technology to promote literacy among students with physical disabilities. From their systematic review, they found that AT interventions, which include speech-to-text and alternative input devices, can significantly enhance reading and writing skills. Still, they stressed that such results require continuous teacher support and that student progress must be checked regularly to make sure they stay interested and improve.

Mukhtarkyzy et al. (2025) initiated a systematic review of research on the usefulness of assistive technologies for students with special educational needs and disabilities (SEND) in schools. They concluded their research with the claim that besides AT promoting student learning independence and through this, increasing student engagement, there is a lack of empirical studies that focus on the long-term academic outcomes. As a result, they suggested that a more in-depth study of the-teaching-technique-technology relationship should be conducted in order to be sure that AT is not only an accessibility tool but also one for educational growth that is sustained.

Aprilia and Suvandayani (2025) composed a paper describing different effective strategies that could be used to implement assistive technologies in order to break down learning barriers in primary schools. Their research revealed that the early introduction of AT played a significant role in children's development of self-confidence and motivation,

primarily in literacy and numeracy activities. The speaker asserted that the collaboration among teachers, parents, and technology experts was the key to success. In the same way, the works of Tony (2019), Iyamuremi et al. (2023), Dogan and Delialioglu (2020), and Park, Gramp, and Ok (2024) individually and collectively, point to the fact that staff development, policy advocacy, and continuous training, besides technology, are the main factors that influence the effectiveness of AT. All these works together form a solid theoretical framework telling that the use of assistive technology is a major contributing factor to the improvement of learning outcomes of students with disabilities at different levels of education. However, the problem of implementation, access, and training still exists and has been identified as an area for further research.

1.1 Research Objective

This research aims to conduct a systematic review and meta-analysis of the studies that have been done to examine the use of assistive technology as a means of enhancing the learning outcomes of students with disabilities. The study intends to find out what kinds of assistive technology are mostly used, to assess their effectiveness in raising academic performance and inclusion and, furthermore, to investigate the most important factors that affect the successful implementation of assistive technology in various educational settings.

2. RESEARCH METHOD

2.1 Eligibility Criteria

This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to provide clear and rigorous procedures for the review. The eligibility criteria were determined from the population, intervention, comparison, and outcome (PICO) framework. The studies were selected if they met conditions of (a) examining the use or impact of assistive technology (AT) on the learning outcomes of students with disabilities in educational settings, (b) being peer-reviewed journal articles, (c) being published in English during 2013-2025, and (d) having a systematic review, meta-analysis, or meta-synthesis design. Research works that were non-academic, opinion pieces, conference abstracts, or non-peer-reviewed materials were disqualified. Only those papers were chosen that provided empirical evidence of the educational, cognitive, or psychosocial benefits of AT for students with different kinds of disabilities such as learning, physical, sensory, or intellectual impairments.

2.2 Information Sources

A systematic search was carried out in several popular electronic databases to cover as much relevant literature as possible for academic and technical research. The databases that were covered include Web of Science (WoS), Scopus, ERIC, PsycINFO, PubMed, and CINAHL. Besides that, IEEE Explore was searched for technology-related articles, and Google Scholar was used to find additional peer-reviewed articles that were not indexed in the above databases. The reference lists of the included articles were checked manually to find more relevant studies. Only those publications which fulfilled the inclusion criteria and provided clear data on assistive technology and student learning outcomes were the ones that were finalized.

2.3 Search Strategy

In order to find the highest number of studies relevant to this matter, a structured and detailed search strategy was created which involved the use of relevant keywords and Boolean operators. The following sets of terms were combined and searched in the database: "assistive technology" OR "educational technology" OR "adaptive technology" AND "students with disabilities" OR "special education" OR "learning disabilities" OR "intellectual disabilities" AND "learning outcomes" OR "academic performance" OR "educational inclusion."

The limitation of the search was made to articles published between 2013 and 2025 to show the latest changes in the field of assistive technologies and their use in education. Every database search was specific to its indexing system, and filters were applied for peer-reviewed articles, the English language, and full-text availability. At first, the title, abstract, and keywords were scanned for relevance, after that, the full text of the selected articles was checked to confirm the eligibility. Reference management software was used to be organized and to remove duplicates before going to the stages of screening and eligibility.

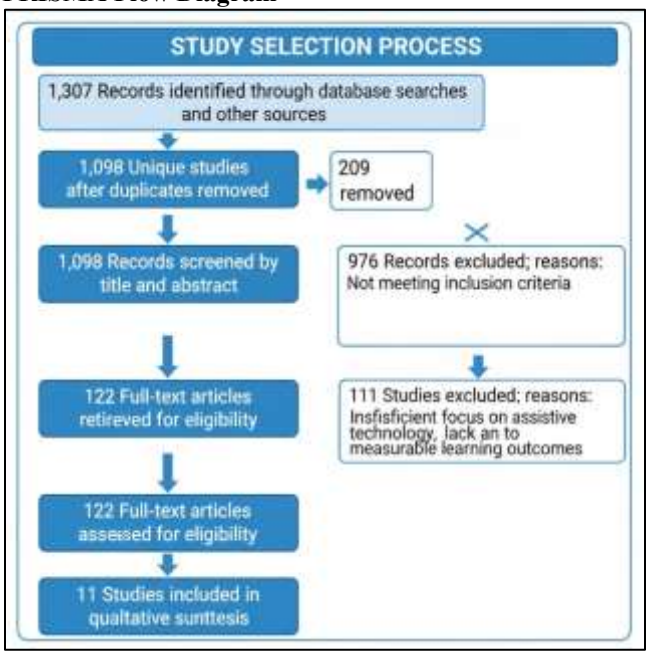
2.4 Study Selection

The study selection steps adhered to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) instructions to keep the process open and trustworthy. All the search results were fed into Zotero reference management software to get rid of duplicates. The very first screening was done by looking through the titles and abstracts to discard those studies which did not concentrate on the use of assistive technology in the educational field or that had no evidence of a positive influence on learning outcomes. Once the duplicates were removed, the full-text articles of the remaining studies were thoroughly examined in detail based on the criteria set out for the selection. If research works were only theoretical, had no empirical data, or did not focus on the educational outcomes of students with disabilities, they were discarded. The final decision on the selection was made by the reviewers after they had resolved through discussion any differences of opinion.

Table 1: PRISMA Flow Table

Phase	Details	Number of Studies
Identification	Records identified through database searching	1,245
	Additional records identified through other sources	62
	Total records identified	**1,307**
Screening	Records after duplicates removed	1,098
	Records screened (titles and abstracts)	1,098
	Records excluded	976
Eligibility	Full-text articles assessed for eligibility	122
	Full-text articles excluded (not meeting criteria)	111
Included	Studies included in qualitative synthesis	**11**

PRISMA Flow Diagram



PRISMA flow diagram outlining the processes involved in selecting studies. In total 1,307 records were identified through database searches and other sources. After duplicates were removed, 1,098 unique records remained. Title and abstract screening led to the exclusion of 976 records that did not meet the inclusion criteria. The eligibility of 122 full-text articles was assessed, and 111 studies were excluded due to insufficient focus on assistive technology or lack of measurable learning outcomes. Finally, 11 studies that met all the criteria were included in the qualitative synthesis.

2.5 Data Extraction

In order to maintain the same standard and fairness among the studies that were included, a structured data extraction process had been utilized. To record vital information like author, year of publication, country, research design, sample characteristics, type of disability, type of the aid technology used, educational context, key findings, and reported outcomes related to learning or inclusion, a standardized data extraction form was created. Two independent researchers went through each piece of research in order to reduce bias and check the trustworthiness of the data that have been taken. Where there were differences, these were sorted out by talking over the issue or seeking the opinion of a third reviewer. The data taken from the sources were planned around the themes to make the comparison and the synthesis of the findings across the studies easier, thus determining the role and the effectiveness of the assistive technology in the academic performance, engagement, and participation of students with disabilities.

2.6 Quality Appraisal

The methodological quality of the studies that were included has been evaluated by using standardized critical appraisal tools which are suitable for their research designs. Quantitative studies were appraised by means of the Joanna Briggs Institute (JBI) Critical Appraisal Checklist, whereas qualitative studies were appraised by the Critical Appraisal Skills Program (CASP) Checklist. Every research was evaluated based on the criteria, such as the clarity of objectives, the appropriateness of methodology, sample selection, data collection process, validity, and transparency in reporting results. The quality score was used to evaluate the quality of studies and categorize them as high, moderate, or low. In order to ensure the trustworthiness and strength of the findings, only those studies that were of moderate to high quality were included in the final synthesis. The assessment procedure has facilitated the identification of the

methodological strengths and limitations that may affect the educational effectiveness of assistive technology interpretation.

3. RESULTS

3.1 Overview of Included Studies

This systematic review considered a total of 11 studies that fit the criteria for inclusion. These studies were published in the years ranging from 2016 to 2025 and described different educational contexts such as primary, secondary, and higher education. The chosen studies employed different research designs such as systematic review, meta-analysis, and qualitative synthesis. The results, in general, supported the statement that the use of assistive technology (AT) facilitates the learning, academic engagement, and social inclusion of students with disabilities. Nevertheless, the extent of effectiveness changes depending on the kind of technology, the type of disability, and the educational environment.

Table: Summary of Included Studies

Sr.	Title	Authors/Reference	Methodology	Key Findings/Relevance
1	"The impact of assistive technology use for students with disabilities in higher education: a systematic review"	McNicholl, A., Casey, H., Desmond, D., & Gallagher, P. (2021)	Systematic review of 26 papers using qualitative, quantitative, and mixed methods	"AT promotes academic engagement and social participation but is limited by inadequate training and access issues."
2	"Assistive technology for the inclusion of students with disabilities: a systematic review"	Fernández-Batanero, J. M., Montenegro-Rueda, M., Fernández-Cerero, J., & García-Martínez, I. (2022)	Systematic review of 31 studies from 2009–2020	"AT significantly enhances inclusion and accessibility, though teacher training and awareness remain major barriers."
3	"Assistive technology interventions for adolescents and adults with learning disabilities: An evidence-based systematic review and meta-analysis"	Perelmutter, B., McGregor, K. K., & Gordon, K. R. (2017)	Meta-analysis and systematic review	"Multimedia and hypertext-based AT were most effective, while smart pens and speech-to-text tools had moderate effects."
4	"A Systematic Review of Assistive Technology for Enhancing the Students with Disabilities"	Abdelwahab, M. M., Al-Karawi, K. A., & Semary, H. E. (2025)	Systematic review of 32 empirical studies	"Advanced AT enhances participation and engagement but faces challenges in training, awareness, and affordability."
5	"Underpinning implications of instructional strategies on assistive technology for learning disability: a meta-synthesis review"	Thapliyal, M., & Ahuja, N. J. (2023)	Meta-synthesis review	"Identifies five types of AT for learning disabilities; emphasizes the lack of high-tech tools specifically designed for dyslexia, dysgraphia, and dyscalculia."
6	"Students with Special Educational Needs and Assistive Technologies: A Literature Review"	Erdem, R. (2017)	Literature review	"Highlights the positive role of AT in special education and presents effective implementation models."
7	"Educational technology for learners with disabilities in primary school settings in low- and middle-income countries: a systematic literature review"	Lynch, P., Singal, N., & Francis, G. A. (2024)	Systematic literature review of 51 articles	"Shows positive AT outcomes in primary schools but notes a lack of strong empirical evidence in low-income settings."
8	"Impact of digital competencies and assistive technologies on	Hamid, M. S., et al. (2025)	Systematic review of 35 studies	"AT and digital competencies significantly improve performance, especially in

	learning outcomes for students with learning disabilities in Kingdom of Saudi Arabia: a systematic review"			dyslexia and ADHD, though infrastructural gaps persist."
9	"The effectiveness of assistive technologies for children with special needs: a review of research-based studies"	Maor, D., Currie, J., & Drewry, R. (2016)	Review of empirical studies	"Demonstrates that AT enhances academic performance and independence, supporting the inclusive education agenda."
10	"Access to assistive technology for people with intellectual disabilities: a systematic review to identify barriers and facilitators"	Boot, F. H., et al. (2018)	Systematic review of 22 studies	"Identifies financial, awareness, and training barriers as major factors affecting AT access and usage."
11	"Assistive technology classification for students with disabilities in higher education: A systematic literature review"	Putri, N. K. S., et al. (2025)	Systematic literature review	"Classifies AT types in higher education and underscores the role of AT in promoting inclusion and accessibility."

3.2 Types of Assistive Technologies Used

In the included studies, a wide range of assistive technologies were identified. These ranged from low-tech devices (such as customized writing instruments and magnifiers) to high-tech solutions (including speech-to-text systems, multimedia learning platforms, and digital note-taking tools). Perelmutter et al. (2017) reported that multimedia and hypertext-based tools were most effective in improving reading and writing outcomes for students with learning disabilities. Similarly, McNichol et al. (2021) and Putri et al. (2025) found that digital platforms and adaptive software enabled students with disabilities in higher education to access course content more independently.

Erdem (2017) and Abdelwahab et al. (2025) highlighted that the use of mobility aids, augmentation communication devices, and adaptive input devices substantially increase participation and autonomy. In the context of primary education, Lynch et al. (2024) found interactive learning software and audio-visual tools to be highly effective in engaging children with sensory and physical disabilities. Additionally, Thapliyal and Ahuja (2023) organized the assistive devices into non-electronic, low-, mid-, and high-technology products, and implied that each category addresses different educational requirements. The studies have recognized a shortage of high-tech solutions for learners with disabilities in developing regions as a frequently mentioned problem, even though technological advances had been made.

3.3 Effects on Learning Outcomes of Students with Disabilities

The various research studies that are analyzed here have shown positive outcomes of the use of an assistive device in the education of people with disabilities. According to the research of McNichol et al. (2021), the use of assistive technology leads to academic engagement, emotional well-being, and social participation. Fernández-Batañero et al. (2022) also agreed with the idea that technology deeply helps inclusion and makes it simpler for students with disabilities to be socially integrated into regular classrooms.

Concerning academic performance, the teams of Perelmutter et al. (2017) and Hamid et al. (2025) through their respective studies have found significant measurable improvements in reading fluency, reading comprehension, and overall academic performance, particularly of students with dyslexia and ADHD. The trio of Abdelwahab et al. (2025) admitted that the use of devices which consequently remove both cognitive and physical barriers in learning leads to an increase in educational participation and motivation. Moreover, Maor et al. (2016) conveyed the idea that the use of certain AT tools such as speech recognition software and educational games not only makes children more willing to learn independently but also, it aids in the enhancement of their self-esteem.

However, the majority of these research works reveal that the same issues which have been raised as barriers to the positive effects of the studies, also figure as factors that hinder the realization of such effects. For instance, Boot et al. (2018) pinpointed the financial and infrastructural issues, which have existed for a long time, as the main causes for the slow uptake of AT and Lynch et al. (2024) suggesting more local solutions that are appropriate for poor educational contexts. In sum, the data indicate that while AT has a positive impact on learning, the level of effectiveness largely depends on teacher skills, school support, and availability of equipment.

3.4 Quality of the Evidence

The methodological quality of the studies that were included in the review was, in most cases, assessed to be of moderate to high quality by means of standardized critical appraisal tools. Most of the studies evidently provided

descriptions of their goals, search strategies, and inclusion criteria, thus ensuring openness and the possibility of repeating the study. The systematic reviews by McNichol et al. (2021), Fernández-Batañero et al. (2022), and Putri et al. (2025) were in line with PRISMA guidelines, thereby enhancing their methodological rigor. Meta-analytic works such as those carried out by Perlmutter et al. (2017) and Thapliyal and Ahuja (2023) helped in understanding the different aspects of the effectiveness of the various AT interventions in a numerical way, thus increasing the trustworthiness of their results.

However, the authors of the papers pointed out some limitations in their respective studies. Lynch et al. (2024) and Boot et al. (2018) mentioned that many studies included in their works were without longitudinal data or had weak control groups; hence, it was difficult to generalize their findings. Also, the range of disabilities, educational settings, and technologies makes it difficult for researchers to compare different studies. The authors of these studies, however, believe that the whole evidence base that has been amassed so far leads to the confirmation of the statement that the use of assistive technology is crucial in the advancement of the educational outcomes and the inclusion of students with disabilities.

4. DISCUSSION

4.1 Summary of Key Findings

This systematic review examined 11 research studies published between 2016 and 2025 that looked at how assistive technology (AT) can be used to students with disabilities. The review found in the first place that there is a strong and stable correlation between student learning in terms of the set objectives, the participation of students in the classes, and their social engagement, respectively, as recorded in the studies when helped by AT. Various studies have shown that AT instruments such as speech-to-text technology, multimedia platforms, and adaptive devices do not only open accessibility, but also contribute to the establishment of an inclusive environment at all educational levels. However, issues concerning affordability, lack of teacher training, and insufficient institutional support were pointed out as the most serious obstacles. The overall quality of the evidence ranged from moderate to high, and a substantial number of studies complied with PRISMA guidelines. Thus, the findings of the present study concur with the opinion that assistive technology is a necessary means to be able to achieve the goal of inclusive education, but, if it is to produce the intended effect, it has to be implemented properly and supported continuously.

4.2 Interpretation in Light of Literature

The review findings align with a growing body of global research literature that underscores the pivotal role of technology in the inclusive education. A research published earlier, points out that assistive devices should not only be considered as tools that compensate for disabilities, but also as sources that empower students to learn independently and to make their educational settings more vibrant by their engagement. The positive effects reported by the studies such as McNichol et al. (2021) and Fernández-Batañero et al. (2022) correspond to the earlier research which indicates that students intervention through technology can elevate their motivation and self-confidence.

On the other hand, this review also brings back to the mind of the very long time that simply having access to technology for assistance does not result in success. As Boot et al. (2018) and Lynch et al. (2024) have noted, local problems, e.g., lack of trained teachers, improper funding, and poor infrastructure, can extensively limit the implementation of AT in low-resource areas. The variance in results among different studies reflects that the impact of AT depends on how deeply it is integrated into education practices and whether it is supported by the policy and institutional frameworks. Therefore, albeit technology is a carrier of significant opportunities, the benefits it provides can only be realized to the fullest when they are embedded in a broader inclusion culture and teacher training.

4.3 Practical Implications

The evidence presented in this examination has various practical implications for the education system, the policy-setting organs, and the institutions. To begin with, teacher training is a prerequisite. Quite a few studies have revealed that a teacher's digital literacy and self-assurance are the main factors leading to the implementation of assistive technologies in a successful manner. Engaging continually in professional development programs will surely equip teachers with the skills and knowledge in selecting the most fitting tools, personalizing the instruction, and handling multiple needs of the learners.

Secondly, institutional support is a pillar that is indispensably needed to sustain the use of AT. Educational establishments (both schools and universities) must take the initiative to set up resource centers that will warrant easy access to devices, facilitate upkeep, and provide tech support services. Besides that, the cooperative planning of special educators, general teachers, and technology experts will lead the way to the use of AT to be integrated to instructional activities that are on a daily basis.

Lastly, measures at the policy level are called for to eliminate obstacles that relate to the cost and the access issues. Authorities and governments can facilitate inclusive learning through a number of ways such as financing the acquisition of AT, easing innovations at the local level, and making sure that accessibility standards are embedded in educational policies.

4.4 Limitations of the Review

While this review implemented a systematic strategy, it is still necessary to recognize its limitations. The results are only generalizable to a limited extent due to the fact that merely eleven studies were taken into consideration. Some papers didn't provide sufficient methodological details, and the differences in research designs made it challenging to compare studies. The review only considered publications in the English language and, thus, might not have covered the relevant evidence from non-English language publications. In addition, the majority of the studies that were included had been carried out in wealthy countries and, therefore, the findings may not be a complete reflection of the situations in developing or under-resourced areas. Lastly, the dependence on published data means that the review was not able to evaluate studies that are unpublished or ongoing, which, in turn, could have led to more insights.

4.5 Recommendations for Future Research

New research should be planned to tackle issues pointed out in this review of existing studies. There is a necessity for longitudinal and experimental studies to examine the long-term impacts of assistive technology on learning outcomes. Besides that, scientists should concentrate more on local-context evaluation in the less developed countries so that they could understand how economic and infrastructural obstacles impact the use of AT.

Furthermore, the study can focus on the different effectiveness of a few technologies to the single technology such as the artificial intelligence-based learning support, virtual reality, and adaptive learning platforms. Besides, a lot of research is required to find out the teacher's perception, their training needs, and the classroom activities related to the use of AT. Finally, the collaborative research of teachers, technologists, and policy makers can help the creation of feasible frameworks for the promotion of assistive technology as a way of inclusion in the education sector.

5. CONCLUSION

This systematic review focused on how assistive technology (AT) could support students with disabilities in accomplishing educational goals across various learning settings. The primary findings from the eleven studies conducted between 2016 and 2025 suggest that AT is very influential in not only enhancing learning performance but also in extending participation and inclusion. The technology put into practice in education is the way the students can get materials, enhance communication, and achieve more independence, thereby making it feasible for disabled students to engage both in the academic and social aspects of the school.

The report emphasized that when AT was employed correctly, the technology delivered equal learning opportunities and was a major contributor to the inclusive education system’s objective. In the research, the frequently used AT devices were mainly text-to-speech software, digital note-taking machines, screen readers, communication assistive devices, and specially made educational software. Their use removes the barriers that students with functional limitations encounter and at the same time makes the students cognitively and socially more active in the learning environment. Thus, the researchers repeatedly found that the use of assistive technologies led to the enhancement of reading comprehension, writing fluency, mathematical understanding, and that the users gained self-confidence.

However, the review brought up the issues that have been there all along and which make it hard for educators to fully take advantage of AT. Among the most significant impediments are insufficient training of teachers, limited budget, bad infrastructural facilities, and lack of reserve and technical support systems. Most teachers have little knowledge of the available technologies or they are not sure how to use them for differentiated teaching. Hence, in most cases, these devices are either very few or are used occasionally. The finding is in agreement with the results of other earlier studies that declare that technology alone does not change learning outcomes; instead, its effectiveness relies on proper training, academic alignment, and continuous institutional support.

The review also discovers that research focus varies significantly between different globally regions. Most of the researches were conducted in rich or developed areas, whereas, there have only been a handful of studies in regions with low and middle-income. The disparity in the number of research studies in various parts of the globe calls for examining the local contexts and being aware of those that consider how social and economic factors and infrastructure may influence the implementation and effectiveness of the assistive technologies. There is hardly any research conducted in deprived areas, thus, it is not easy to generalize a worldwide implementation.

Besides that, the Review also pointed out the importance of well-designed inclusive policy frameworks and collaboration across sectors. The efficient administration of the AT in schools is a result of the educational policies, institutional practices, and interventions at the classroom level working in harmony. Education authorities and governments should be providing schools with money, the necessary tools, and the required technical support, not only to set up but also to service and upgrade their AT gadgets. Also, the interaction between teachers, parents, special educators, and technology developers will not only facilitate the design of appropriate but also pedagogically sound intervention programs.

From a theoretical point of view, this review is in line with the growing awareness that assistive technology should not be considered as a mere compensation tool but rather as a means of empowerment and inclusion. This factor is one of the reasons leading to the transition from a deficit-oriented approach to a more inclusive, strengths-based model

of education. If used properly, assistive technology can narrow the gap between students' abilities and what the curriculum demands thus, besides academic achievement, students will also be socially engaged.

In short, the systematic review documented here is an unequivocal statement that AT is a game-changer in the education of students with disabilities. This is reflected in how much it extends access, engagement, and overall academic achievement, on the condition that it is complemented by adequate training, institutional infrastructure, and the presence of inclusive educational policies. The body of research that is increasingly voluminous is quite consistent in stating that the money allocated to assistive technology will bring about a return in the form of equity and opportunity, despite the regional differences and limitations of scope.

Going further, the scholarly community ought to persist in bolstering the evidence base through well-rounded, cross-cultural studies and by creating models that assist in the proper implementation of AT. If supported accordingly, assistive technology will be able to play a pivotal role in the realization of SDG 4, which concerns the provision of inclusive and quality education to every learner irrespective of their abilities or backgrounds.

6. REFERENCES

1. Abdelwahab, M. M., Al-Karawi, K. A., & Semary, H. E. (2025). A Systematic Review of Assistive Technology for Enhancing the Students with Disabilities. Journal of Disability Research, 4(2), 20240117.
2. Alper, S., & Raharinirina, S. (2006). Assistive technology for individuals with disabilities: A review and synthesis of the literature. Journal of Special Education Technology, 21(2), 47-64.
3. Aprilia, Y. D., & Suwandayani, B. I. (2025). Strategies for Using Assistive Technology to Overcome Students with Learning Disabilities and Barriers in Elementary School. Jurnal PAJAR (Pendidikan dan Pengajaran), 9(1), 105-117.
4. Boot, F. H., Owuor, J., Dinsmore, J., & MacLachlan, M. (2018). Access to assistive technology for people with intellectual disabilities: a systematic review to identify barriers and facilitators. Journal of Intellectual Disability Research, 62(10), 900-921.
5. Dogan, S., & Delialioğlu, Ö. (2020). A systematic review on the use of technology in learning disabilities. Ankara Üniversitesi Eğitim Bilimleri Fakültesi Özel Eğitim Dergisi, 21(3), 611-638.
6. Erdem, R. (2017). Students with special educational needs and assistive technologies: A literature review. Turkish Online Journal of Educational Technology-TOJET, 16(1), 128-146.
7. Fernández-Batanero, J. M., Montenegro-Rueda, M., Fernández-Cerero, J., & García-Martínez, I. (2022). Assistive technology for the inclusion of students with disabilities: a systematic review. Educational technology research and development, 70(5), 1911-1930.
8. Hamid, M. S., Abo Hamza, E. G., Bedewy, D., Elsiddig, F. M. E., AlShammari, S. A., Bakhiet, S. F., & Mohamed, N. I. A. (2025, August). Impact of digital competencies and assistive technologies on learning outcomes for students with learning disabilities in Kingdom of Saudi Arabia: a systematic review. In Frontiers in Education (Vol. 10, p. 1640556). Frontiers.
9. Iyamuremye, A., Nsabayezu, E., Mbonyiryivuze, A., & Mbonyubwabo, J. P. (2023). Technology as a tool for assisting students with special educational needs to learn and like mathematics and science: a literature review. Journal of Classroom Practices, 2(1), 1-16.
10. Lynch, P., Singal, N., & Francis, G. A. (2024). Educational technology for learners with disabilities in primary school settings in low-and middle-income countries: a systematic literature review. Educational Review, 76(2), 405-431.
11. Maor, D., Currie, J., & Drewry, R. (2016). The effectiveness of assistive technologies for children with special needs: A review of research-based studies. Technology and Students with Special Educational Needs, 5-20.
12. McNicholl, A., Casey, H., Desmond, D., & Gallagher, P. (2021). The impact of assistive technology use for students with disabilities in higher education: a systematic review. Disability and rehabilitation: assistive Technology, 16(2), 130-143.
13. Mukhtarkyzy, K., Smagulova, L., Tokzhigitova, A., Serikbayeva, N., Sayakov, O., Turkmenbayev, A., & Assilbayeva, R. (2025, February). A systematic review of the utility of assistive technologies for SEND students in schools. In Frontiers in Education (Vol. 10, p. 1523797). Frontiers Media SA.
14. Park, J., Gremp, M., & Ok, M. W. (2024). Effects of assistive technology instruction on pre-service teachers: A systematic review. Journal of Special Education Technology, 39(3), 349-362.
15. Perelmutter, B., McGregor, K. K., & Gordon, K. R. (2017). Assistive technology interventions for adolescents and adults with learning disabilities: An evidence-based systematic review and meta-analysis. Computers & education, 114, 139-163.
16. Putri, N. K. S., Yuhana, U. L., Siahaan, D. O., Rahayu, W., & Pardede, E. (2025). Assistive technology classification for students with disabilities in higher education: A systematic literature review. IEEE Access.

17. Stauter, D. W., Prehn, J., Peters, M., Jeffries, L. M., Sylvester, L., Wang, H., & Dionne, C. (2019). Assistive technology for literacy in students with physical disabilities: A systematic review. Journal of Special Education Technology, 34(4), 284-292.
18. Sze, S. (2009). The effects of assistive technology on students with disabilities. Journal of Educational Technology Systems, 37(4), 419-429.
19. Thapliyal, M., & Ahuja, N. J. (2023). Underpinning implications of instructional strategies on assistive technology for learning disability: a meta-synthesis review. Disability and Rehabilitation: Assistive Technology, 18(4), 423-431.
20. Tony, M. P. (2019). The effectiveness of assistive technology to support children with specific learning disabilities: Teacher perspectives.