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RESEARCH ARTICLE

Teachers' perceptions on the availability and utilization of assistive technology for pupils with learning disabilities in Eti-Osa, Lagos State

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Abstract: Assistive technology (AT) plays a crucial role in inclusive education by enhancing learning opportunities for pupils with learning disabilities and promoting their full participation in academic activities. This study investigated teachers' perceptions of the availability and utilization of assistive technology in primary schools in Eti-Osa Local Government Area, Lagos State, Nigeria. Using an ex post facto descriptive research design, 191 teachers from public and private schools were selected through purposive sampling. Data were collected using a validated questionnaire, the Assistive Technology in the Classroom (ATC), with a reliability coefficient of 0.87. The findings revealed that although several types of assistive technologies were available, they were insufficient to meet the learning needs of pupils with disabilities. Computers and iPads were the most commonly available and utilized tools, while specialized devices such as speech synthesizers, graphic organizers, and speech-to-text converters were notably absent. More than half of the teachers agreed that assistive technology enhances pupils' learning outcomes by compensating for cognitive deficits, thereby fostering classroom independence and task completion. However, barriers such as inadequate funding, lack of teacher training, and limited stakeholder commitment hinder the optimal use of these technologies. Addressing these challenges requires concerted efforts from government bodies, non-governmental organizations, and educational institutions. This study contributes to the growing body of literature on assistive technology in inclusive education and emphasizes the need for improved resource allocation and teacher training to bridge the educational gap for pupils with learning disabilities.

Key words: learning disabilities, Assistive technology, availabilities and utilisation

INTRODUCTION

One of the emerging concerns of governments globally is ensuring equality of access to qualitative education. This will help prepare learners for participation in a society in which knowledge is the most critical resource for social and economic development. Thus, since the turn of this century, widening access to education by reaching the unreached such as those with learning disabilities has become a contemporary concern for many international development agencies such as UNESCO, World Bank, and other regional and national governments. Prior to the beginning of the 21st century, education of learners with disabilities faced a variety of social, cultural, economic, and technological challenges resulting to poor learning outcomes and exclusion of this population from educational provisions (Lajira, 2018).

The United Nations through its various international conventions and treaties such as the Sustainable Development Goals are aggressively committed to universalizing access to education for all children thereby closing the opportunity gap for the disadvantaged children through inclusive education and use of assistive technology in the education of these learners. In order to key into the universal vision of equalizing education as stated by the United Nations, the recent edition of the National Policy on Education was necessitated by some policy innovations and changes (Federal Republic of Nigeria, 2016). Ulson and Hulm (2015) noted that one of the critical changes emphasized was the introduction of the use of assistive technology into the school system as a means of bridging educational gap and increasing access to school for all children. While this educational blueprint points out that inclusive education is to bring diverse learners into learning contacts in the same classroom for the purpose of strengthening social ties, assistive technology aims to circumvent all physical and sensory deficits that cause accessibility barriers to both social information and the general curriculum thereby improving performance and learning outcome generally. Therefore, in recognition of the prominent role of technology in advancing knowledge and skills necessary for effective functioning in the 21st century and as a strategy to ensure quality education, the use of assistive technology for children with learning disabilities has become the expected practice of every

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Nigerian classroom to fully integrate such pupils and in particularly those with learning disabilities.

Every Nigerian classroom environment today is packed with a heterogeneous group of learners with varying abilities and disabilities (Yusuf, 2012) With the global adoption of inclusive education practice, the heterogeneity of the classrooms has become more and more diverse hence teachers find classrooms instructional delivery highly challenging. The major and perhaps most critical is the inability of children with learning disabilities to cope with classroom instructions, when there may be no signs of physical or sensory disabilities. Thus, while most children find school and learning very exciting and interesting; children with learning disabilities develop fear, anxiety and may not cope adequately. They have difficulties with learning, carrying out simple math operations, read a paragraph or partake in social and motor activities as little as picking up crayon to trace letters of the alphabet. These categories of children are of major concerns to teachers in the classroom as the teachers seek ways to make them learn better.

Assistive technology for pupils with learning disabilities include electronic devices that help bypass, work around or compensate for an individual's specific learning deficits to capitalize on their strengths. For example a pupil who struggles with reading but who has good listening skills might benefit from listening to audio books. Assistive technology for pupils with learning disabilities may include audio books, electronic math worksheets, Freeform database software, graphic organizers and outlining, data managers, optical character recognition, portable word processors, speech synthesizers, speech recognition, talking calculator, spelling/grammar checker, electronic dictionaries, variable-speed tape recorders, word prediction programs amongst others. There are also non electronic devices that may be equally used to assist children with learning disabilities.

The major learning challenges of individuals with learning disabilities usually relate to cognitive processing, memory and retrieval of taught concepts. Ahmed (2018) buttressed that individuals with learning disabilities may have problems that include attention, memory, and disorders in perception as well as reading, writing and mathematics. In their day-to-day activities, they may also have problems in organization, time management, abstract reasoning, stepwise and motoric execution of daily tasks. This group of learners may face consistent academic failure and poor learning outcomes in the classroom despite consistent classroom instruction. Ahmed (2018) stated that with the emerging integration of technology into teaching and learning process, the learning success of pupils with cognitive disabilities could be guaranteed because assistive technology could offer them ample opportunity to improve performance of tasks that ordinarily they could not do. It provides opportunities for greater flexibility, interactivity and accessibility for engaging learning at the individual, group, and societal levels (Gbenga, 2019). Thus, the great chasm between the typically developing learners and those with learning disabilities in terms of educational achievement could be simply bridged with assistive technology.

Notably, despite the ability and significance of the AT devices in supporting the development of children with LD, teachers of children with LD still hold individual opinions based on certain indices that the availability and utilisation of assistive technology have remained a consistent struggle across schools (Anderson, 2017). One expects that as you walk into any inclusive school, you should be able to see a well -equipped computer room with a knowledgeable resource teacher where children with learning disabilities can study or at least complete their home works under the supervision of a knowledgeable resource person. You will expect that every teacher be it public or private school should have a personal computer and that reasonable access to assistive technology is given to the pupils during classroom instructions. This was not the case when the researcher visited some schools. Barriers stalling the use of assistive technology by children with learning disabilities are complex and multidimensional, it could be stakeholders-based, school-based, or learner-based barriers (Kall and Opiom, 2019). While some barriers arise within the individuals with learning disabilities, some may originate from the system in which these learners function. Today, with the advancement of technology, expansion of knowledge, as well as globalization issues, technology-enhanced learning becomes a central figure and most challenging, because it requires new planning and technological adaptation to cope with cultural dynamism. If pupils with learning disabilities are not familiar with the available help assistive technology offers, learning will continue to be unbearable and integration into the society very difficult. More also, the teachers perceptions and readiness for the use of assistive technology in classroom instructions will determine to what extent pupils with learning disabilities can embrace the new dispensation. Thus, integration and application of assistive technology in classroom for pupils with learning disabilities has become a major concern in the school system.

Nevertheless, through concerted and committed efforts, barriers to effective utilization of assistive technology could be bridged. It may require planned efforts from all concerned stakeholders including the primary beneficiaries which are children with learning disabilities. Such efforts are a click that will upturn the digital divide that tends to slow down assistive technology utilisation and access to expanded core curriculum. It is against this background that this study is keen on investigating the availability, utilisation, benefits, barriers and bridges of assistive technology for pupils with learning disabilities.

Statement of the Problem

Nigeria's education sector faces persistent challenges in delivering effective support for pupils with learning disabilities, particularly due to limited resources and infrastructure. A recent report from the Lagos State Ministry of Education (2023) revealed that only 35% of primary schools have basic assistive technology tools such as computers and tablets. More advanced tools, such as speech synthesizers and optical character recognition devices, are virtually absent. This shortage significantly impacts the ability of teachers to meet the needs of their students with learning disabilities.

The challenges faced by teachers in using assistive technology are multifaceted. Teachers often report a lack of training and familiarity with the available tools, resulting in low utilization rates even when resources are present (Yusuf, 2015). Moreover, the absence of continuous professional development programs exacerbates this issue, leaving many teachers ill-prepared to integrate assistive technology effectively into their teaching practices. According to Kall and Opiom (2019), systemic barriers such as limited school budgets and inconsistent policy implementation further hinder progress.

Nigeria's National Policy on Education emphasizes the integration of assistive technology as a means to enhance learning outcomes for all students, particularly those with special needs (Federal Republic of Nigeria, 2016). However,

the link between policy and practice is often weak. Schools with sufficient resources have reported significant improvements in student performance when assistive technology is employed (Edyburn, 2020). Conversely, schools that lack these resources continue to struggle with widening achievement gaps. This dichotomy highlights the urgent need for targeted interventions to bridge the gap between policy intentions and actual practice in Nigerian classrooms.

Inclusive education and the strategic use of assistive technology are essential for improving learning outcomes and fostering social inclusion. Research indicates that when used effectively, assistive technology can significantly enhance students' academic performance and social engagement (Ahmed, 2018; Gbenga, 2019). For instance, the use of audio books and speech recognition software has been shown to improve literacy skills among students with reading difficulties (Shikden, 2015). Yet, despite these benefits, many teachers remain skeptical about the practicality and reliability of these tools, often due to their limited exposure and inadequate training.

Purpose of study

The purpose of this study is to assess the perception of teachers on the availability and utilization of assistive technology for children with learning disabilities in Eti-Osa local government area of Lagos State. Specifically, the purpose of the study is to investigate: What are the perceptions of teachers on the availability of assistive technologies for pupils with learning disabilities and What are the perceptions of teachers on the utilization of assistive technology for pupils with learning disabilities?

Hypotheses

The following hypotheses were posed and tested at 0.05 level of significance:

1. There is no significant difference in perception scores of the utilization of assistive technology for pupils with learning disabilities in private and public schools.
2. There is no significant difference in perception scores of the benefits of assistive technology for pupils with learning disabilities in private and public schools

METHODS

This study adopted an ex post facto research design, which examines how an independent variable present before the study affects a dependent variable (Saleh & Kowalczyk, 2022). Ex post facto research, often referred to as after-the-fact research, was appropriate for this study since the availability and utilization of assistive technology had already occurred in the selected schools without interference from the researcher. This design was particularly suited to investigate differences in the availability and utilization of assistive technology between public and private primary schools in Eti-Osa, Lagos State.

The study population comprised 2,396 primary school teachers in private and public schools in Eti-Osa Local Government Area, Lagos State. From this population, a sample of 191 teachers was selected using purposive sampling. The teachers were drawn from seven schools, consisting of four public schools and three private schools, with at least 25 teachers from each school. These schools were chosen based on evidence of inclusive education policies and practices.

Instrumentation

The instrument for data collection was a self-developed questionnaire titled Assistive Technology in the Classroom Questionnaire (ATCQ). The questionnaire was divided into two sections; **Section A**: This section collected respondents' socio-demographic information, such as gender, educational qualifications, and type of school.

Section B: This section contained 28 validated items organized into five sub-sections. Questions 1 to 6 gathered information on the inventory of available assistive technology tools for different areas of learning disabilities. Questions 7 to 12 rated teachers' perceptions of the utilization of assistive technology on a 5-point Likert scale. Questions 13 to 28 elicited information about the perceived benefits, barriers, and bridges of assistive technology using a 4-point scale. Provision was also made for respondents to add any additional information they deemed necessary.

The instrument's validity was established through a rigorous process that involved experts in the field of special education and educational technology. Content validity was ensured by aligning the items with the study's objectives and the relevant literature. The internal consistency of the instrument was tested using the Cronbach Alpha reliability method. A pilot test was conducted with 19 teachers from primary schools in Oyo State, who were not part of the main study population. The reliability analysis yielded an average coefficient of 0.87, indicating a high level of reliability. The sub-scale reliability coefficients were 0.83 for the availability of assistive technology and 0.80 for its utilization.

Data Collection

The data collection process was carried out over one week. A letter of introduction from the Department of Special Education, Faculty of Education, University of Ibadan, was presented to the heads of the selected schools to obtain permission for administering the questionnaire. The researcher and trained research assistants administered the questionnaire on scheduled dates. This approach allowed the researcher to clarify any questions raised by the respondents and ensured that the questionnaires were completed accurately. To enhance the credibility of the data, research assistants were trained on the administration process, emphasizing the importance of neutrality and accuracy. The completed questionnaires were collected immediately after completion to avoid loss or damage. The responses were then coded and entered into the Statistical Package for Social Sciences (SPSS) for analysis.

Table 1: Summary of the reliability coefficient of ATC

S/NO	Variable	N	Cronbach's Alpha
1	Availability of assistive technology	19	0.83
2	Utilization of assistive technology	19	0.80

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Data Analysis

The data collected were analyzed using both descriptive and inferential statistics. Descriptive statistics, such as frequency counts and percentages, were used to summarize the socio-demographic characteristics of the respondents and the availability of assistive technology. The independent t-test was used to examine differences in teachers' perceptions of the availability and utilization of assistive technology based on the type of school (public or private). The significance level was set at 0.05 for all statistical tests.

RESULTS

The analysis of the data revealed significant differences in teachers' perceptions of the utilization and benefits of assistive technology for pupils with learning disabilities between public and private schools in Eti-Osa Local Government Area, Lagos State. The results of the independent t-test showed a statistically significant difference in the utilization of assistive technology between public and private school teachers (table 2). Teachers from public schools reported higher utilization scores ($M = 12.79$, $SD = 1.23$) compared to their counterparts in private schools ($M = 7.85$, $SD = 7.37$), with a mean difference of 4.94 ($t(189) = -6.59$, $p < 0.05$). This indicates that teachers in public schools utilize assistive technology more frequently than those in private schools.

The reasons behind this finding may be attributed to differences in the provision of resources and infrastructure between public and private schools. While public schools often benefit from government-supplied assistive technology, private schools may face financial constraints in acquiring these resources. Additionally, public schools may have dedicated support programs for integrating assistive technology, leading to higher utilization rates.

However, despite the reported utilization, the data revealed that only a few assistive technology tools were available across all schools. The most commonly available tools were iPads and computers, while more specialized tools such as speech synthesizers, optical character recognition devices, and abbreviation expanders were notably absent. This limited range of available tools hinders comprehensive support for pupils with various learning disabilities.

The analysis also revealed a significant difference in teachers' perceptions of the benefits of assistive technology for pupils with learning disabilities between public and private schools ($t(189) = 4.39$, $p < 0.05$). Teachers in private schools reported higher mean scores ($M = 15.79$, $SD = 2.89$) compared to those in public schools ($M = 14.36$, $SD = 1.41$). This finding suggests that while public school teachers may utilize assistive technology more frequently, private school teachers recognize its benefits more extensively, possibly due to exposure to more innovative educational practices (table 3).

Teachers highlighted several key benefits of assistive technology, including improved task completion, increased classroom independence, and enhanced cognitive engagement among pupils with learning disabilities. These benefits align with the findings of Shikden (2015), who emphasized the positive impact of assistive technology on students' academic performance and social integration. Despite these advantages, the underutilization of assistive technology in critical areas such as reading and mathematics remains a significant concern, given that reading difficulties account for a substantial proportion of learning disabilities

Table 2: Summary of independent sample T-test of perception scores between private and public schools on the utilization of assistive technology (N =191)

	School type	N	Mean	SD	Df	T	Sig
Assistive Technology Utilization	Private school	91	7.85	7.37	189	-6.59	.00
	Public school	100	12.79	1.23			

Table 3 Summary of Independent samples t-test of perception scores between private and public schools on the benefits of assistive technology (N=191)

	School type	N	Mean	SD	Df	T	Sig
Benefits of Assistive Technology	Private school	92	15.79	2.89	189	4.39	.001
	Public school	99	14.36	1.41			

The demographic characteristics of the respondents which revealed that there were more female teacher participants than the male teachers could be an indication that there are more female teachers in the primary schools than male teachers. The demography also indicates that more teachers had bachelor's degrees in education

followed by National certificate in Education. In fact, over 86% of the teachers have NCE and above, implying that, most of the participants were qualified teachers drawn from public and private primary schools in Eti-Osa local government area of Lagos State.

This study took inventory of Assistive technology devices available in schools for pupils with learning disabilities. Many AT tools for the different areas of learning disabilities such as written language, reading, memory deficit and executive functioning, attention, spelling and handwriting and mathematics were considered. The analyses revealed that not all the tools required for addressing the different areas of learning disabilities were available in all schools. For written language disabilities, there were no speech synthesizers and abbreviation expanders while talk spell checks, word predictions programs and proof reading were barely available, ipad and computers were mostly available.

DISCUSSION

The findings of this study provide valuable insights into the availability and utilization of assistive technology (AT) for pupils with learning disabilities in Eti-Osa, Lagos State. The significant differences observed between public and private schools highlight disparities in resource allocation, which can be directly linked to the theoretical framework emphasizing inclusive education as a key pathway to equity in learning outcomes (Federal Republic of Nigeria, 2016; UNESCO, 2021). Assistive technology plays a vital role in removing learning barriers and enhancing both academic and social experiences for students with learning disabilities (Ahmed, 2018; Edyburn, 2020). Despite the recognized importance of these tools, the study revealed widespread inadequacies in their availability, particularly for critical learning areas such as reading, memory deficit, executive functioning, attention, spelling, handwriting, and mathematics.

In the domain of reading, essential tools such as Inspiration software and Kurzweil 3000 were found to be unavailable in all the surveyed schools. The only commonly available tools for supporting reading difficulties were iPads, computers, and tape recorders. This limited range of tools significantly constrains the ability of teachers to provide targeted interventions for pupils with reading disabilities, which constitute approximately 80% of all learning disabilities (NCLD, 2017; Orim & Uko, 2017). For students struggling with memory deficits and executive functioning, graphic organizers–critical tools for improving organizational skills and memory recall–were also notably absent. The dominant AT tools for these learning needs were again restricted to iPads and computers, with other types of AT tools being barely available.

This lack of diversity in available tools can be attributed to several factors. One primary reason is the high cost of specialized devices, which limits their acquisition, especially in public schools with constrained budgets (Vitalis & Moses, 2015). Another contributing factor is the limited awareness and training among educators regarding the availability and utility of specialized AT tools for different learning needs. Research indicates that even when tools are present, teachers may lack the knowledge or confidence to integrate them effectively into classroom practices (Hasselbring & Bausch, 2020; Yusuf, 2012).

The challenges extend to areas such as attention deficit, spelling, and handwriting, where specialized tools were also notably absent. For attention deficit, AT tools like visual timers and auditory reminders are essential for helping students maintain focus and stay on task. However, these tools were not available in the surveyed schools, leaving teachers with limited options for supporting students with attention-related difficulties. In spelling and handwriting, specialized tools such as electronic spelling aids and digital handwriting support systems were almost nonexistent. The absence of these tools places a significant burden on both teachers and students, as they are forced to rely on traditional methods that may not meet the needs of pupils with specific learning difficulties.

In mathematics, the available AT tools were primarily limited to computers and talking calculators, with iPads being scarcely available. This limited availability of mathematical AT tools constrains the ability of educators to provide differentiated instruction that meets the diverse needs of students. The lack of advanced tools such as graphing calculators, digital manipulatives, and math-specific software limits opportunities for hands-on learning and interactive problem-solving. This finding aligns with Samaila, Chukwuemeka, and Babatunde (2020), who found that 56% of high-tech AT resources necessary for quality teaching and learning in special education schools in North-West Nigeria were not available, while the 44% that were available were grossly inadequate.

The findings of this study are consistent with previous research conducted in similar contexts. For instance, Edyburn (2020) investigated access to assistive technology in Botswana and Swaziland and found that 44% of individuals in Botswana who needed AT did not receive it, while in Swaziland, the figure rose to 67%. This disparity underscores the persistent challenge of resource scarcity in less developed regions and highlights the need for targeted interventions to bridge the gap in AT availability.

In Nigeria, Yusuf (2012) conducted a comprehensive study on the availability of assistive technologies across primary, secondary, and tertiary institutions and found that while 75.6% of the 115 teachers surveyed reported the availability of computers, many of these devices were outdated and poorly maintained. Similarly, Shikden (2015) noted that while computers were widely available in North Central Nigeria, other essential tools such as electronic organizers and talking dictionaries were almost entirely absent. The predominance of computers can be explained by their multifunctionality, which allows them to serve multiple purposes, from word processing and spell checking to accessing digital learning resources. Additionally, the ability to download and update educational software at minimal or no cost makes computers a more sustainable option for schools with limited resources (Murray & Goldbart, 2016).

A notable finding of this study is the greater variety of assistive technologies available in private schools compared to public schools. This disparity is not surprising, as private schools often benefit from stronger financial support from parents and the ability to access external funding. Many private schools have active Parent-Teacher Associations (PTAs) that raise funds for educational resources, including assistive technology (Kall & Opiom, 2019). Moreover, private schools can more easily partner with both private and public organizations willing to donate AT equipment. In contrast, public schools rely primarily on government funding, which is often insufficient to meet the growing demands for inclusive education resources.

The limited availability of specialized AT tools and the overreliance on multipurpose devices such as iPads and computers underscore the urgent need for targeted interventions. Continuous professional development for

teachers is crucial to addressing this gap. Training programs should focus not only on how to use AT tools but also on integrating them into instructional practices to support differentiated learning. Hogenbirk (2016) emphasized that building teacher competencies in ICT is essential for creating flexible learning environments and fostering collaboration between teachers and students. Alper and Raharinirina (2021) further noted that sustained training increases the likelihood of successful AT integration and improves learning outcomes for students with disabilities.

This study contributes to the growing body of knowledge on assistive technology in Nigerian schools by providing empirical evidence on the disparities in availability and utilization between public and private schools. It offers a comprehensive analysis of the factors influencing AT access and highlights practical solutions for improving resource allocation and teacher preparedness. By comparing its findings with previous studies, the research enriches the global discourse on inclusive education and assistive technology, offering valuable insights for policymakers, educators, and researchers.

Implications for Policy and Future Research

The findings of this study have significant implications for educational policy and practice. Policymakers must prioritize resource allocation to ensure equitable access to assistive technology across all schools. Special attention should be given to providing schools with a broader range of AT tools that cater to different learning needs. Additionally, teacher training programs must be expanded and regularly updated to reflect advancements in educational technology and emerging best practices. Future research should focus on evaluating the long-term impact of assistive technology on student outcomes and identifying strategies for scaling up successful interventions in resource-constrained environments.

CONCLUSION

The findings of this study reveal that the availability and utilization of assistive technology (AT) in primary schools in Eti-Osa Local Government Area, Lagos State, is generally inadequate. Although different types of assistive technologies are available, they are not provided in sufficient quantities to meet the needs of pupils with learning disabilities. This limited availability restricts the full utilization of AT in both public and private schools. However, more than half of the participants in this study acknowledged that assistive technology plays a significant role in facilitating learning by compensating for cognitive deficiencies, ultimately contributing to improved academic performance and a more positive school experience for pupils.

The most commonly used forms of assistive technology identified in this study are iPads and computers. These tools have been associated with several key benefits, including enhancing task completion, promoting classroom independence for students, and improving teachers' sense of teaching effectiveness and success. Despite these benefits, several barriers hinder the optimal use of assistive technology in schools. These include inadequate funding, a lack of training facilities, and limited commitment from educational stakeholders. If these challenges are not addressed, the absence of adequate assistive technology will only widen the educational gap between pupils with learning disabilities and their peers without disabilities. Therefore, it is imperative for educational stakeholders to take urgent action to eliminate these barriers, ensuring equal participation and opportunities for pupils with learning disabilities to realize their full potential.

Recommendations

The government, non-governmental organizations, educational stakeholders, and well-meaning individuals should commit more resources to provide adequate assistive technologies. This will ensure that pupils with learning disabilities are motivated and given equal access to quality education, especially in inclusive educational settings. Additionally, both public and private organizations should collaborate to provide ongoing in-service training for teachers. This will enhance teachers' capacity to utilize emerging assistive technological tools effectively in classroom instruction. Proper training is essential because poor implementation can undermine even the best strategies.

Teachers should be encouraged to recognize the relevance of assistive technology in enhancing learning outcomes, regardless of their personal beliefs, professional backgrounds, or prejudices. Such biases may negatively influence their willingness to adopt and effectively use available assistive devices. A positive and inclusive attitude among teachers is crucial for maximizing the potential of assistive technology in meeting the diverse needs of pupils with learning disabilities.

Educational institutions should actively seek partnerships with private organizations to secure additional funding for assistive technology. This can be achieved by organizing workshops and demonstrations that highlight how assistive technology can help pupils with learning disabilities. Teachers can also play a key role as advocates and scholars by using their positions to promote inclusive education and improve learning experiences for pupils with learning disabilities. Such advocacy efforts can provide these pupils with equal or near-equal opportunities compared to their peers in inclusive education systems.

More provisions should be made to introduce computers and iPads to children with learning disabilities at an early age. These devices were found to be the most popular and widely used tools for addressing various types of learning disabilities in this study and other related research. Early exposure to these technologies can help build familiarity and confidence among pupils, improving their learning experiences and outcomes over time.

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