Utilization of Digital Resources for Learning by Students with Intellectual Disabilities in Southern Nigeria

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Abstract: *Aim*: This study investigated the use of digital resources for learning among students with intellectual disabilities in Southern Nigeria.

Method: A descriptive survey design was adopted. The study involved 530 participants, including special education teachers, school administrators, and caregivers across six states in Southern Nigeria, selected through a multi-stage sampling technique. Data were collected using a structured questionnaire (DRUSEQ) with a reliability coefficient of 0.80. Descriptive statistics and Pearson's Product Moment Correlation were used for analysis.

Results: Findings revealed moderate availability of digital tools, particularly Smart Boards and text-to-speech software, but low and inconsistent usage among students with intellectual disabilities. Infrastructural and financial constraints were key barriers, with teacher training and student motivation also playing roles. While most stakeholders valued digital tools, a notable minority expressed skepticism. A statistically significant but weak positive relationship was found between digital resource usage and educators' perceptions of student learning outcomes.

Recommendation: Greater investment is needed to provide assistive digital tools and address systemic issues such as funding, internet access, and technical support in special education settings.

Keywords: Digital resources, students with intellectual disabilities, learning, students, cross river state, akwa ibom states, inclusive education, special schools.

INTRODUCTION

Intellectual disabilities (ID) are characterized by significant limitations in intellectual functioning and adaptive behavior, affecting an individual's conceptual, social, and practical skills. These limitations pose notable barriers to academic achievement, often necessitating personalized instruction and support strategies. The rise of digital technology has created new opportunities to address these challenges. Tools such as text-to-speech software, interactive learning apps, and communication devices have shown promise in enhancing communication, cognitive development, and engagement among students with intellectual disabilities.

Globally, many education systems—particularly in developed countries—are integrating digital tools within

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inclusive education frameworks. However, in low- and middle-income countries like Nigeria, particularly in the southern region, this integration is hindered by infrastructural constraints, limited teacher training, and weak implementation of existing policies. Although Nigeria's National Policy on Education supports both inclusive education and the integration of ICT, the practical application remains inconsistent, especially in special education.

For students with intellectual disabilities, assistive digital tools and educational software offer pathways to improve access, participation, and academic outcomes. Yet, in Southern Nigeria, the extent of availability and effective utilization of such tools is not well documented. Persistent disparities in infrastructure and resource allocation have contributed to a digital divide that disproportionately affects special education settings.

While global studies highlight the potential of digital tools to enhance learning for students with special needs, region-specific data from Nigeria—particularly its southern states—is limited. Without such data, it becomes difficult for educators, policymakers, and stakeholders to develop targeted strategies or allocate resources effectively. This study, therefore, aims to explore the utilization of digital resources among students with intellectual disabilities in Southern Nigeria. It examines current practices, identifies key barriers, and proposes actionable strategies to enhance the role of digital tools in special education.

Objectives of the Study

The primary objective of this study is to investigate the use of digital resources for learning among students with intellectual disabilities in Southern Nigeria.

The specific objectives are to:

1. Determine the types of digital resources available for students with intellectual disabilities in Southern Nigeria.
2. Assess the extent to which these digital resources are utilized in special education settings.
3. Identify the factors facilitating or hindering the use of digital resources for learning by students with intellectual disabilities.
4. Examine the perceived impact of digital resource use on the learning outcomes of students with intellectual disabilities.
5. Propose strategies to improve access to and effective utilization of digital learning resources in special education.

Research Questions

Based on the objectives, the following research questions guide the study:

1. What types of digital resources are available for students with intellectual disabilities in Southern Nigeria?
2. To what extent are digital resources being utilized in special education settings?
3. What factors promote or hinder the use of digital resources by students with intellectual disabilities?
4. How do teachers and caregivers perceive the impact of digital resources on students' learning outcomes?
5. What strategies can enhance the effective utilization of digital resources in teaching students with intellectual disabilities?

Statement of Hypothesis

Use of digital resources has no significant perceived impact on the learning outcomes of students with intellectual disabilities.

Significance of the Study

This study holds significant value for several stakeholders in the field of education, policy, and disability advocacy in Nigeria:

Policy Makers: The findings will provide evidence-based recommendations for improving inclusive education policies, particularly regarding the integration of ICT in special needs education.

Educational Institutions: School administrators and special education centers will gain insights into gaps in digital resource availability and usage, enabling them to make informed decisions about resource allocation and teacher training.

Special Educators: The study will help teachers identify effective digital tools and practices for enhancing learning experiences for students with intellectual disabilities.

Caregivers and Parents: By understanding the benefits and challenges of digital learning tools, caregivers can become more involved and supportive of their children's education.

Researchers: The research will contribute to the body of literature on digital inclusion and special education in Nigeria, particularly in under-researched regions like Southern Nigeria.

Students with Intellectual Disabilities: Ultimately, the study aims to improve the quality of education and learning outcomes for this marginalized group by promoting equitable access to digital learning opportunities.

Scope and Delimitation of the Study

This study is delimited to the utilization of digital resources for learning by students with intellectual disabilities in Southern Nigeria. It focuses on selected public and private special education schools and inclusive units across three purposively chosen states within the southern region.

The study is confined to:

- Students formally diagnosed with intellectual disabilities
- Teachers and caregivers involved in the student's education
- Administrators managing special education programs.

Delimitations include:

- The study does not cover students with other forms of disabilities (e.g., visual or hearing impairments).
- It does not assess the technical quality or software design of the digital resources but rather their availability, usage, and perceived effectiveness.
- Only basic ICT tools and educational technologies (e.g., tablets, educational apps, assistive devices) are considered under “digital resources.

Limitations of the Study

- **Generalizability**: The findings may not be generalized to the entire country, as the study is limited to only three states in Southern Nigeria.
- **Access to Participants**: Gaining access to some special schools may be restricted due to administrative policies or sensitivity around working with students with intellectual disabilities.
- **Self-report Bias**: Data collected through questionnaires may be subject to personal bias or inaccurate reporting by respondents.
- **Technology Awareness Gap**: Some teachers or caregivers may lack sufficient knowledge of available digital resources, which can potentially impact the quality of responses.
- **Resource Constraints**: The study may be limited by time and funding, which can impact the scale of data collection and analysis.

LITERATURE REVIEW

Concept of Intellectual Disabilities

Intellectual disabilities (ID) refer to limitations in intellectual functioning and adaptive behavior, which affect social, conceptual, and practical life skills [1]. These limitations manifest before the age of 18 and typically require lifelong support. Students with ID often face challenges in communication, reasoning, memory, and problem-solving [7]. The use of digital resources may be hindered by various barriers, including a lack of infrastructure, inadequate teacher training, and limited access to assistive technologies—challenges that have been documented in similar Nigerian contexts [8].

Digital Resources and Their Relevance in Special Education

Digital resources encompass a diverse range of tools and technologies, including tablets, educational apps, screen readers, and communication aids, that enhance learning and support accessibility. Research shows that these tools improve participation, engagement, and academic performance among students with special needs [2, 9]. They support differentiated instruction and help overcome barriers posed by conventional teaching methods.

For instance, multimedia platforms support visual and auditory learning styles, while assistive technologies, such as text-to-speech software, assist non-verbal or minimally verbal learners in communicating [10]. Moreover, platforms such as Google Classroom and specialized apps like

Proloquo2Go enable personalized and interactive learning experiences. According to UNESCO [11], there is a need for the consistent integration of digital resources in special education classrooms. The low daily and weekly usage suggests significant underutilization despite the growing global emphasis on inclusive digital education.

Utilization of Digital Resources in Nigeria's Educational System

In Nigeria, while digital technology integration is being promoted through various policies, its practical application in special education is still limited. Studies reveal that most schools, particularly in rural or under-resourced areas of southern Nigeria, lack access to digital infrastructure, trained personnel, and technical support [3, 6]. Teachers often report low digital literacy and limited exposure to assistive technologies. The limited access to the internet restricts the use of web-based learning platforms. It hinders the integration of real-time and up-to-date digital resources, consistent with findings by Okeke and Eze [12], who reported infrastructural limitations as a barrier in Nigerian special education settings. These tools support individualized instruction and help bridge gaps in traditional teaching [13]. There is a significant adoption of interactive display technologies in special education classrooms, aligning with findings by Al-Azawei *et al*. [10], who emphasized that SmartBoards enhance engagement and provide visual reinforcement for students with cognitive impairments.

UNESCO [14], Alnahdi [15], and Flanagan and Bouck [16] emphasize that while digital tools, such as text-to-speech applications, visual aids, and learning management systems, can enhance accessibility and support individualized learning, their effectiveness is contingent upon integration within a broader, inclusive educational framework. These tools reduce learning barriers and promote engagement among students with intellectual disabilities; however, their impact is moderated by factors such as teacher competence, the quality of implementation, institutional support, and student readiness. Thus, technology alone is not a sufficient solution; it must be effectively aligned with pedagogical and contextual needs to deliver meaningful learning outcomes.

Additionally, cultural attitudes toward disability, lack of funding, and weak policy implementation further hinder the widespread adoption of digital tools in special education [17]. Al-Azawei *et al*. [18] and Okeke and Eze [12] emphasized the transformative role of technology in inclusive education when equitably accessed and appropriately implemented. Mobile and flexible learning devices are not yet widely distributed in the surveyed schools, limiting students' ability to engage with adaptive educational applications [19]. This highlights a critical shortfall in access to augmentative and alternative communication (AAC) tools, which are crucial for expressive language development [20]. Text-to-speech tool allows students to hear digital text read aloud, fostering better comprehension and independent learning [21].

Studies highlight that technology—when inclusive and adaptive—can foster engagement, autonomy, and improved learning outcomes [22, 23]. Increased exposure to digital resources during and after the COVID-19 pandemic has led to a more positive perception of digital resources and accelerated the global adoption of technology in education [24]. Stakeholders may have observed tangible improvements in student motivation and access to individualized content during this period.

Financial constraints significantly hinder the adoption of educational technology in special education [14]. Limited budgets often result in outdated equipment, insufficient devices, and a lack of access to specialized digital content tailored for students with intellectual disabilities. According to Alnahdi [15], even when digital tools are available, the lack of ongoing technical support renders them underutilized or misused. Stable internet access is a basic prerequisite for most digital tools, and its absence limits synchronous learning, resource access, and collaboration. Many mainstream tools lack accessibility features or adaptive learning paths necessary for these learners. Custom-designed assistive technologies remain under-deployed due to cost and training barriers. Literature continues to emphasize the need for specialized training in the use of inclusive technology [16]. Doss *et al*. [25] found that learner motivation improves significantly with properly adapted digital interventions.

Benton *et al*. [22] highlight the role of peer collaboration in fostering professional growth and technological competency among teachers. Coaching models help demystify digital tools and encourage sustained usage. Khowaja *et al*. [26] found that such tools lead to improved behavioral outcomes and greater independence. Flanagan and Bouck [16] emphasize the need for ongoing professional

development to support technological integration. Furthermore, caregiver training enhances continuity between home and school learning environments [27]. According to UNESCO [14], the lack of adaptive IT services can exacerbate inequities and hinder the efficacy of digital interventions.

Studies have shown that when appropriately designed, digital tools can support independence in learners with ID through features such as visual prompts, simplified interfaces, and gamification [28]. The low usage rate indicates a potential mismatch between available tools and the unique needs of these learners. Research by Doss *et al*. [25] emphasizes the necessity of home-school collaboration, particularly in special education contexts where continuity and reinforcement of learning across environments are essential. Al-Azawei *et al*. [18] highlighted persistent barriers to technology adoption in special education, including lack of teacher training, limited access to appropriate resources, and concerns about students' capacity to engage with technology independently. Research by Sharma *et al*. [29] emphasizes the importance of teacher facilitation in enabling learners with cognitive challenges to utilize educational technology effectively. Teachers play a crucial role in adapting content, providing scaffolded support, and maintaining student engagement. Additionally, some educators may feel overwhelmed by the dual burden of pedagogy and technology integration, particularly in under-resourced schools [23]. Individuals with limited experience or inconsistent exposure to digital tools highlight the need for structured training and demonstrable evidence of efficacy [27].

MATERIALS AND METHODS

Experimental Setting

This study adopted a descriptive survey design. This design is suitable for collecting data from a sample population to determine the current status of digital resource utilization among students with intellectual disabilities. It allows the researcher to describe phenomena as they exist without manipulating variables.

Area of Study

The study area is located in Southern Nigeria. This is one of the six geopolitical zones in Nigeria representing both a geographic and political region of the country. It comprises six states: Akwa Ibom, Bayelsa, Cross River, Delta, Edo, and Rivers, respectively. The zone is located with a Latitude of 4.5° N to 6.0° N and a Longitude of 5.0° E to 7.5° E. The zone stretches along the Atlantic seaboard from the Bight of Benin coast in the west to the Bight of Bonny coast in the east. It encompasses much of the Niger Delta, which is crucial to the environment and economic development of the region. Although the South-South region represents only five percent of Nigeria's territory, it contributes significantly to the Nigerian economy due to its extensive oil and natural gas reserves. The region has a population of approximately 26 million people, accounting for around 12 percent of the country's total population.

Participants/Sample

The population of the study comprised 3023 special education teachers, school administrators, and caregivers of students with intellectual disabilities in selected schools and special education centers across the six states in Southern Nigeria. A multi-stage sampling technique was employed. In the first stage, three states from the southern region were purposively selected based on the availability of special education programs. In the second stage, stratified sampling was employed to select schools and centers that offer services to students with intellectual disabilities. Finally, simple random sampling was used to select respondents from each institution.

The rationale for using a multi-stage sampling technique was adopted for this study to efficiently manage the large and geographically dispersed population of special education stakeholders across the six states in Southern Nigeria. This method enabled a systematic and practical approach to sampling by selecting participants in successive stages: first at the state level, then at the institutional level (schools and special education centers), and finally at the individual level (teachers, administrators, and caregivers).

This approach was chosen to ensure representativeness across diverse socio-educational contexts within the region while also addressing logistical challenges such as travel, resource constraints, and participant accessibility. By narrowing down the sample in stages, the study maintained a balance between statistical rigor and operational feasibility, ensuring that the selected sample accurately reflected the population under study.

The sample size comprised 300 special education teachers, 30 school administrators, and 200 caregivers. In carrying out simple random sampling, a process in

which every member of the population is given an equal and independent opportunity to be selected, the names of all caregivers from each school were written on pieces of paper and placed in a bag. Thereafter, the bag was thoroughly shaken with the folded pieces of paper inside. A research assistant selected a piece of paper from the bag, after which the paper was replaced, and another piece of paper was selected until the required number of caregivers for the study was completely picked from each school. This process was repeated to sample the respondents used for the study.

Instrument for Data Collection

A structured questionnaire titled "Digital Resource Utilization in Special Education Questionnaire (DRUSEQ)" was used to collect data. The questionnaire includes both closed and open-ended items organized into sections covering availability, utilization, challenges, and perceptions. It consists of two sections. Section A consists of personal demographic data of the respondents, such as gender, Age, Years of working experience, and educational level, while Section B, measured on a four-point Likert scale of SA, A, N, D, SD, consists of five items in each sub-section measuring types of digital resources are available for students with intellectual disabilities, extent are digital resources being utilized in special education settings, factors promote or hinder the use of digital resources by students with intellectual disabilities, teachers and caregivers perception on the impact of digital resources on students' learning outcomes and strategies for enhancing the effective utilization of digital resources in teaching students with intellectual disabilities.

In this study, face validity was established. Two experts in the field of test and measurement at the University of Calabar scrutinized the items to certify that the instruments had face validity and could be used for the study. The results of the validation revealed that only two items were dropped, two were modified, and two new items were added to the questionnaire. It was established that the questionnaire was sufficient, and therefore, it was approved for use in the study.

The Cronbach's Alpha reliability coefficient method was used to establish the reliability of the instrument. To ascertain the reliability of the instrument, a trial test was carried out using (10) respondents drawn from the Special Secondary School in Abakalike Municipal Council, which is not part of the population area. The result of reliability is 0.80.

The procedure for data collection involved a written request by the researcher to the school Head for permission to administer the instrument to the teachers, caregivers, and administrators. Upon granting the request, the researcher met the respondents at their schools to administer the instrument. The researcher administered the instrument with the assistance of three research assistants, as the scope of the study was large. The research assistants were trained on how to obtain verbal informed consent and interact with academic staff during the administration of the questionnaire.

During data collection, respondents were verbally informed of the confidentiality of their responses and the protection provided, including their voluntary participation in the study and the freedom to withdraw at any time. The researcher explained the issues and answered any questions raised by the respondents. The questionnaires were distributed, and some were collected on the same day, while some were collected a few days later.

After collecting the questionnaires, codes, and scores were assigned to each item. For ease of data preparation, a coding schedule was created by developing a key for each construct in the instrument in a tabular format.

Data was analyzed using descriptive statistics (mean, Standard deviations, frequency, and percentage) to address the research questions. Inferential statistics, such as Pearson's Product Moment Correlation, were used to determine the significance of relationships between variables, including the availability of digital resources and their level of utilization. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) program, version 26.

Ethical Consideration

This study adhered fully to the ethical norms and principles of social science research, ensuring the privacy, confidentiality, and security of its data.

- Furthermore, the investigator ensured that the participants in the study provided their informed consent and did so voluntarily.
- Participants received a comprehensive explanation of the study, including its purpose.
- The participants gave their informed consent for the study, having been made aware of its goal,

which may have influenced their decision to participate.

- Participation was strictly voluntary, with no coercion or undue influence.
- Participants were informed of their right to withdraw from the study at any point without any repercussions.
- For participants requiring further clarification, dedicated sessions were arranged to address their concerns.

Diagnostic Criteria or Assessments used to Identify Students with intellectual Disabilities

- Family history
- Word decoding and encoding abilities.
- Reading fluency and comprehension.
- Spelling and writing skills.

Exclusionary Criteria

- Rule out other potential causes, such as inadequate instruction, sensory impairments, or neurological conditions.

Observation and Informal Assessments

Teacher Observations

- Difficulty recognizing sight words.
- Frequent reading errors or reversals.

Writing Samples

- Poor spelling
- Poor grammar
- Handwriting inconsistencies.

Inclusion Criteria

To ensure the relevance, validity, and reliability of the study, the following inclusion criteria were applied when selecting participants.

- Participants must be caregivers.
- Participants must be a school administrator in a special school
- Participants must provide informed consent to participate in the research.
- The study included institutions that have access to fully implemented ICT tools.
- Participants must be proficient in the language of instruction (e.g., English) to assess the effectiveness of ICT tools effectively.
- Participants must have used ICT for a minimum of one year.

RESULTS/DISCUSSIONS

This section presents the demographic distribution of the respondents who participated in the study. The demographic variables considered include gender, age, occupation, years of experience working with students with intellectual disabilities, and educational qualification. These characteristics are crucial for understanding the background of the respondents and the context of their responses regarding the use of digital resources in special education settings.

The data presented in Table **1** reveals that out of 530 respondents, a significant proportion were male (73.4%), while females constituted only 26.6%. This gender disparity suggests a male-dominated workforce in special education roles within the study area.

Concerning age distribution, the majority of respondents (58.1%) fell within the 31-50 years age bracket. This indicates a predominantly middle-aged workforce, likely to possess adequate professional maturity and practical exposure to teaching students with intellectual disabilities. Respondents aged 30 years and below accounted for 26.8%, while those aged 51 years and above made up 15.1%.

In terms of occupation, teachers constituted the majority at 56.6%, followed by caregivers (37.7%) and administrators (5.7%). The dominance of teaching and caregiving roles ensures that data was collected from individuals who are actively engaged in the instructional and welfare needs of students with intellectual disabilities.

The respondents' years of experience further strengthen the reliability of the data. A combined total of 423 respondents (79.8%) had more than 10 years of experience working with students with intellectual disabilities, with 41.9% having 11-20 years and 37.9% having 21 years or more. Only 20.2% had 10 years of experience or less, suggesting that the study benefitted from insights provided by seasoned professionals.

Table 1: Demographic Variables of Respondents

Variable		Frequency	Percentage
Gender	Male	389	73.4
	Female	141	26.6
	Total	530	100
Age	≤30 years	142	26.8
	31-50 years	308	58.1
	≥51 years	80	15.1
	Total	530	100
Occupation	Teacher	300	56.6
	Administrator	30	5.7
	Caregiver	200	37.7
	Total	530	100
Years of experience working with students with intellectual disabilities	≤10 years	107	20.2
	11-20 years	222	41.9
	≥21 years	201	37.9
	Total	530	100
Educational Qualification	B.Ed	462	87.2
	PGDE	27	5.1
	M.Ed	41	7.7
	Total	530	100

Source: Field work (2025).

Finally, regarding educational qualifications, the majority of respondents (87.2%) held a Bachelor of Education (B.Ed.) degree, while 5.1% possessed a Postgraduate Diploma in Education (PGDE), and 7.7% held a Master's degree in Education (M.Ed.). This educational profile reflects a workforce that is formally trained in education; however, further capacity building through postgraduate education may be necessary for specialized instructional strategies involving digital resources. Overall, the demographic data portrays a group of experienced and professionally trained individuals capable of providing valid and reliable responses concerning the use of digital resources to support learning among students with intellectual disabilities.

Test of Research Questions

Research question one: What types of digital resources are available for students with intellectual disabilities in Southern Nigeria?

This section presents the data on the types of digital resources available for students with intellectual disabilities in special education settings across Southern Nigeria. The results are visually illustrated in Figure **1**. The chart above displays the frequency and percentage distribution of various digital learning resources reported as available in the respondents' educational environments. From the figure, it is evident that Smart Boards are the most widely available digital resource, with a frequency of 129 respondents (24.3%) reporting their presence. This suggests that many special education settings are incorporating interactive technology into teaching practices. Educational software is also notably available, cited by 113 respondents (21.3%). This reflects the growing use of content-specific programs designed to reinforce learning for students with intellectual disabilities.

Text-to-speech software was identified by 111 respondents (20.9%). This is a crucial tool for learners with speech or reading impairments, indicating a level of inclusion through the use of assistive technology. Internet access/WiFi was reported by 82 respondents (15.5%). This relatively low availability may limit the use of online learning tools and access to updated educational content in some schools. Speech-generating devices, used by students with severe communication challenges, were acknowledged by

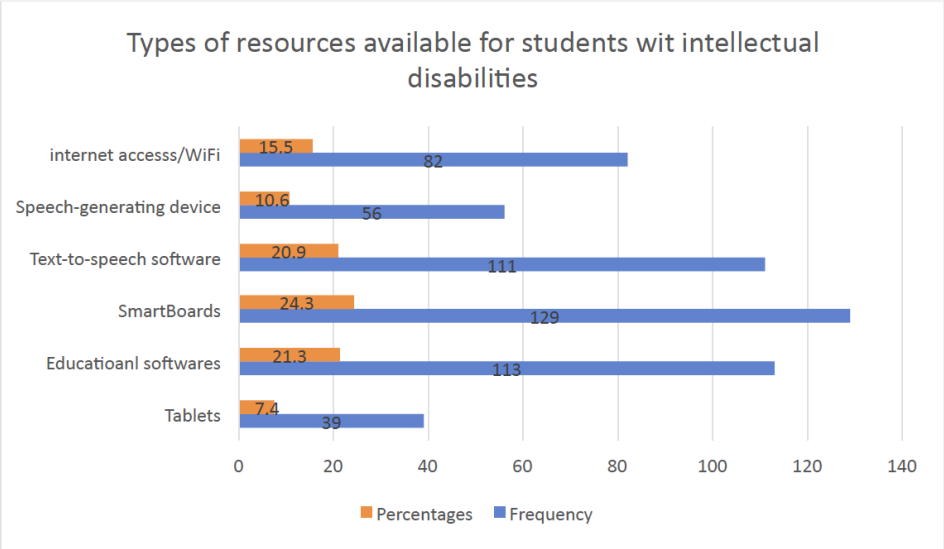

Figure 1: Types of resources available for students with intellectual disabilities. (Source: Field Survey, 2025).

only 56 respondents (10.6%), suggesting limited access to advanced assistive communication tools. Tablets were the least available resource, reported by 39 respondents (7.4%). This points to a significant gap in portable, personalized learning devices that can support interactive and adaptive learning. The data reveal a moderate level of digital resource availability across the sampled special education settings, with a particular emphasis on hardware-based tools, such as SmartBoards, and software, including text-to-speech and educational programs. However, the relatively low availability of internet access, tablets, and speech-generating devices indicates infrastructural and funding challenges that may hinder the full integration of digital learning.

The findings suggest that while progress is being made in equipping special education centers with some digital tools, more targeted investment is needed—especially in providing mobile and communication-specific technologies that enhance accessibility and learning independence for students with intellectual disabilities. These results directly support Objective 1 of the study, which aims to identify the types of digital resources available to these students and provide a basis for recommending further improvements in access and implementation.

Their findings align with those of Al-Azawei *et al*. [18, 12], whose prior research emphasizes the transformative role of technology in inclusive education when it is equitably accessed and appropriately implemented. The finding aligns with Al-Azawei *et al*. [18], who report a significant adoption of interactive display technologies in special education classrooms and emphasize that Smart Boards enhance engagement and provide visual reinforcement for students with cognitive impairments. These tools support individualized instruction and help bridge gaps in traditional teaching [13]. This tool allows students to hear digital text read aloud, fostering better comprehension and independent learning [21].

The limited access to the internet restricts the use of web-based learning platforms. It hinders the integration of real-time and up-to-date digital resources, consistent with findings by Okeke and Eze [12], who reported infrastructural limitations as a barrier in Nigerian special education settings. Speech-generating devices, which assist non-verbal students, were available to only 56 respondents (10.6%). This points to a critical shortfall in access to augmentative and alternative communication (AAC) tools, which are essential for expressive language development [20]. Finally, tablets were the least reported resource, with 39 respondents (7.4%) acknowledging their availability. This suggests that mobile and flexible learning devices are not yet widely distributed in the surveyed schools, limiting students' ability to engage with adaptive educational applications [19].

Research question two: To what extent are digital resources being utilized in special education settings?

How Often are Digital Tools used in Teaching Students with Intellectual Disabilities?

Figure **2** illustrates the frequency at which digital learning resources are utilized by students with

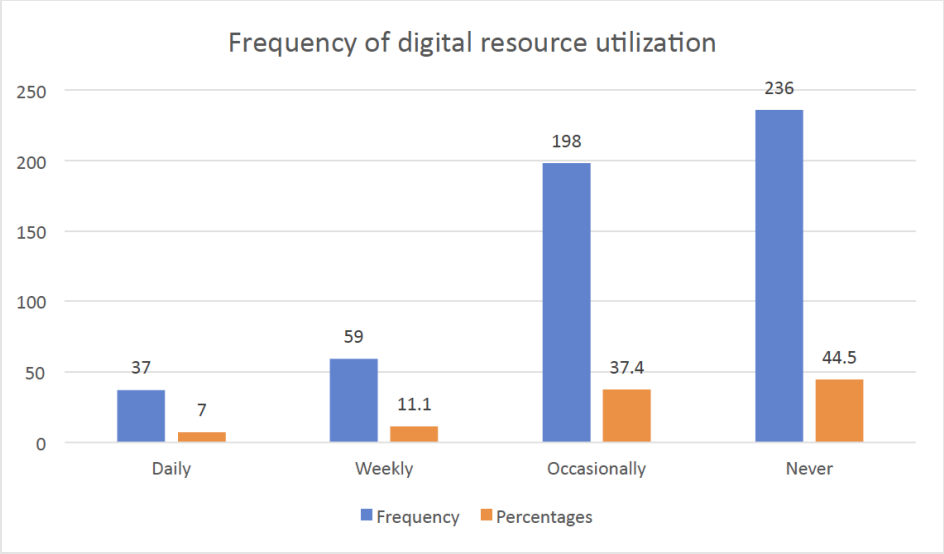

Figure 2: Frequency of digital resource utilization in teaching students with intellectual disabilities.

intellectual disabilities in special education settings across Southern Nigeria. The data reveals that digital resource utilization is generally low and inconsistent. Out of the 530 respondents, 44.5% (n = 236) indicated that they never utilize digital resources. 37.4% (n = 198) reported occasional use of digital resources. 11.1% (n = 59) reported using digital resources weekly. Only 7% (n = 37) reported using these resources daily.

This distribution highlights a critical gap in the consistent integration of digital resources in special education classrooms. The low daily and weekly usage suggests significant underutilization despite the growing global emphasis on inclusive digital education [11].

The high proportion of respondents who reported "never" using digital resources may be attributed to various barriers such as lack of infrastructure, inadequate teacher training, and limited access to assistive technologies—challenges that have been documented in similar Nigerian contexts [27]. These findings underscore the need for targeted interventions, such as professional development programs, improved funding, and infrastructure support, to foster more frequent and effective use of digital tools in special education settings.

Who Primarily uses Digital Tools?

The chart includes responses from 530 participants and categorizes them into four categories: Students independently, Teachers assist students, Caregivers at home, and Not used at all. The distribution of responses is as follows: Not used at all: 231 responses (43%); teachers assist students: 221 responses (42%); students independently: 46 responses (9%); caregivers at home: 32 responses (6%). The data reveals a significant underutilization of digital tools among students with intellectual disabilities, with 43% of participants indicating that these tools are not used at all. This finding aligns with recent literature highlighting persistent barriers to technology adoption in special education, including lack of teacher training, limited access to appropriate resources, and concerns about students' capacity to engage with technology independently [10].

The high percentage (42%) of teacher-assisted use suggests that when digital tools are employed, they are largely mediated by educators. This aligns with research by Sharma *et al*. [29], which emphasizes the importance of teacher facilitation in enabling learners with cognitive challenges to utilize educational technology effectively. Teachers play a crucial role in adapting content, providing scaffolded support, and maintaining student engagement.

Only 9% of students are reported to use digital tools independently. This figure highlights the limited autonomy that students with ID can achieve in digital learning environments. Studies have shown that when appropriately designed, digital tools can support independence in learners with ID through features such as visual prompts, simplified interfaces, and gamification [28]. The low usage rate indicates a potential mismatch between available tools and the unique needs of these learners. The minimal involvement of caregivers (6%) suggests that digital

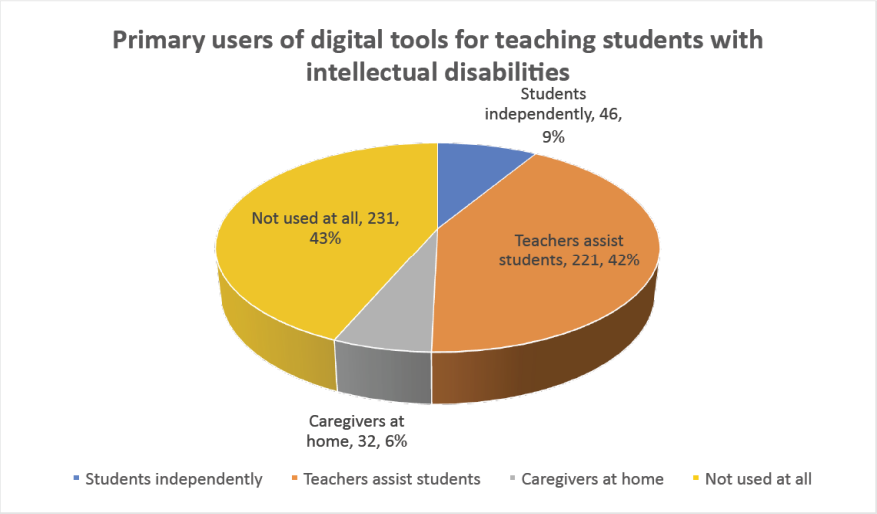

Figure 3: Frequency of users of digital tools.

learning at home is not well integrated. This may be due to several factors, including the digital literacy levels of caregivers, lack of institutional support, or the assumption that learning is solely the school's responsibility. Research by Doss *et al*. [25] emphasizes the necessity of home-school collaboration, particularly in special education contexts where continuity and reinforcement of learning across environments are essential.

Research question three: What factors promote or hinder the use of digital resources by students with intellectual disabilities?

Figure **4** explores the key barriers that limit the integration of digital resources in educational settings, especially for learners requiring special support. The frequency and percentage of respondents reporting each challenge are as follows: lack of training for teachers: 39 (7.4%), inadequate digital tools: 89 (16.8%), poor internet/infrastructure: 102 (19.2%), lack of technical support: 114 (21.5%), unwillingness of students: 22 (4.2%), lack of funding: 164 (30.9%). A linear trendline applied to the frequency data reveals a rising pattern, indicating an increasing concern as challenges become more infrastructure- and resource-intensive.

The most prominent challenge, as identified by 30.9% of respondents, is lack of funding. This mirrors global findings that financial constraints significantly hinder the adoption of educational technology in

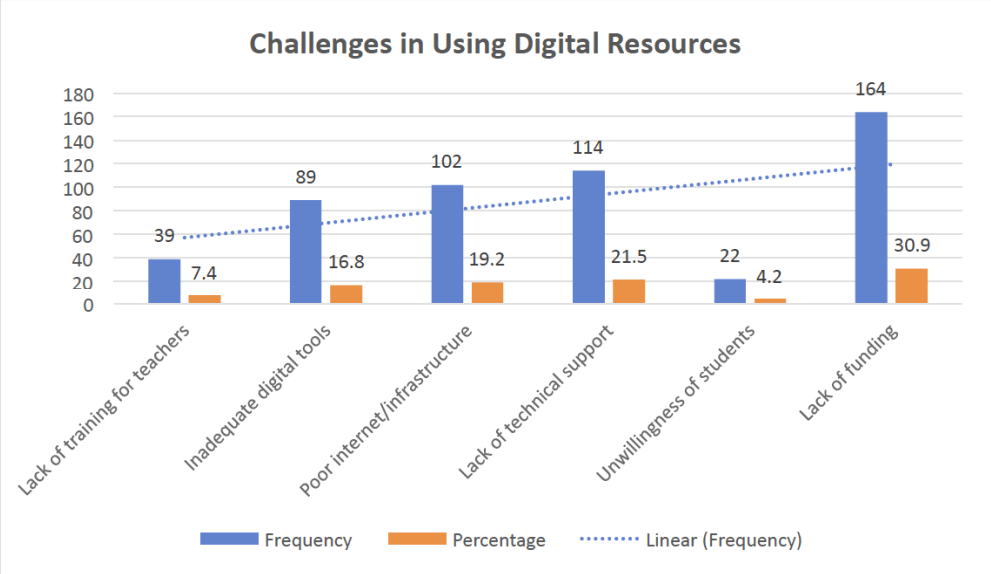

Figure 4: Challenges in Using Digital Resources.

special education [14]. Limited budgets often result in outdated equipment, insufficient devices, and a lack of access to specialized digital content tailored for students with intellectual disabilities [10].

Lack of technical support (21.5%) and poor internet and infrastructure (19.2%) are also major barriers. These issues reflect infrastructural inadequacies in schools, particularly in rural or under-resourced areas. According to Reich [27], even when digital tools are available, the lack of ongoing technical support renders them underutilized or misused. Stable internet access is a basic prerequisite for most digital tools, and its absence limits synchronous learning, resource access, and collaboration.

Inadequate digital tools (16.8%) point to the mismatch between available technologies and the specific needs of students with intellectual disabilities. Many mainstream tools lack accessibility features or adaptive learning paths necessary for these learners [11]. Custom-designed assistive technologies remain under-deployed due to cost and training barriers.

Interestingly, the lack of training for teachers (7.4%) is comparatively less reported, although it is still significant. This could either mean slight improvement in teacher development programs or underreporting due to a lack of awareness. However, other literature continues to emphasize the need for specialized training in the use of inclusive technology [16].

Student unwillingness (4.2%) is the least cited challenge, suggesting that when the infrastructure and support systems are in place, students—regardless of disability—are generally willing to engage with digital tools. This aligns with Doss *et al*. [25], who found that learner motivation improves significantly with properly adapted digital interventions.

This research reveals that infrastructural and financial limitations are the leading barriers to the effective use of digital tools in special education. While teacher training and student motivation are important, systemic resource-based issues such as funding, internet access, and technical support must be addressed first for digital inclusion to succeed.

Research question 4: How do teachers and caregivers perceive the impact of digital resources on students' learning outcomes?

Do you Believe that Digital Resources Improve Students' Learning Outcomes?

To assess the perceptions of stakeholders regarding the effectiveness of digital tools in teaching students with intellectual disabilities, as measured by levels of agreement or disagreement. A Likert scale was used to gather participants' opinions on a key statement regarding the usefulness or appropriateness of digital tools in special education. The pie chart summarizes the frequency and percentage distribution of responses across five categories: Strongly Agree: 223 (42%); Agree: 154 (29%); Neutral: 32 (6%); Disagree: 23 (4%); Strongly Disagree: 98 (19%). A combined 71% of respondents (Strongly Agree + Agree) demonstrated a positive perception of digital

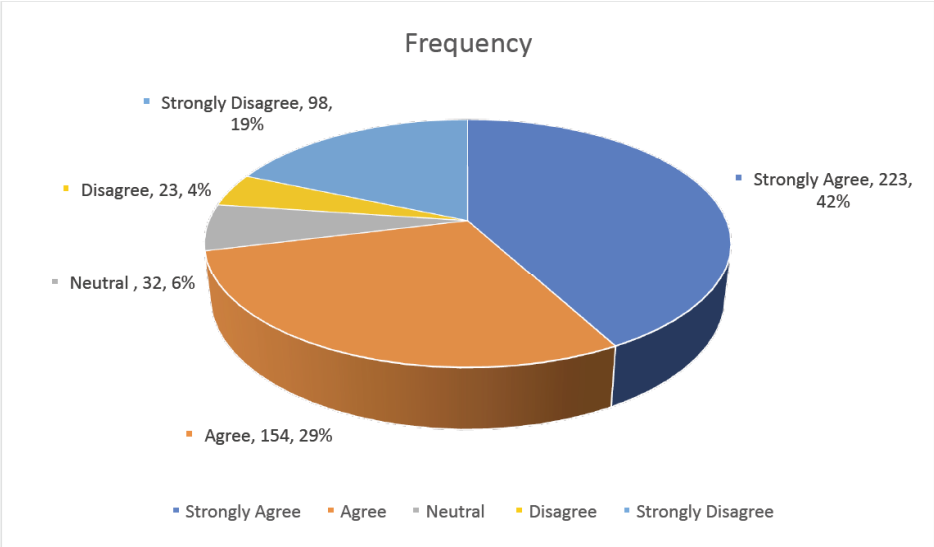

Figure 5: Perceptions of stakeholders regarding the effectiveness of digital tools in teaching students with intellectual disabilities, as measured by levels of agreement or disagreement.

resources in special education. Only 23% (those who disagree or strongly disagree) showed a negative perception, while 6% remained neutral. This suggests that a majority of stakeholders acknowledge the value of digital resources; however, a significant minority continues to express concerns or skepticism.

The high percentage (42%) of "Strongly Agree" responses aligns with recent literature findings that emphasize the potential benefits of digital tools for students with intellectual disabilities. Studies highlight that technology—when inclusive and adaptive—can foster engagement, autonomy, and improved learning outcomes [22, 23].

The positive perception could be influenced by increased exposure to digital resources during and after the COVID-19 pandemic, which accelerated the adoption of technology in education worldwide [24]. Stakeholders may have observed tangible improvements in student motivation and access to individualized content during this period. However, the 19% who Strongly Disagree cannot be ignored. Their reservations could be rooted in Poor infrastructure, lack of training, Inadequate accessibility features, and Perceived irrelevance for certain learning goals [16].

Additionally, some educators may feel overwhelmed by the dual burden of pedagogy and technology integration, particularly in under-resourced schools [14]. The neutral group (6%) may represent individuals with limited experience or inconsistent exposure to digital tools, highlighting the need for structured training and demonstrable evidence of efficacy [27]. Overall, the perception of digital resources in special education is largely positive, offering fertile ground for policy and implementation strategies. However, the sizable group of skeptics and neutral respondents indicates a need for further investment in training, infrastructure, and inclusive design.

Research question five: What strategies can enhance the effective utilization of digital resources in teaching students with intellectual disabilities?

The bar chart in Figure **6** presents frequency and percentage data on various strategies perceived as effective by respondents: Among the six strategies surveyed, the use of tools with built-in text-to-speech features emerged as the most prominent, with 221 responses (41.7%). Peer mentoring and coaching models received the most responses, with 115 responses (21.7%), followed by software-supporting visual schedules, which ranked third at 101 responses (19.1%). Other strategies, including workshops on assistive technology (7.4%), caregiver training (6.1%), and specialized IT support (4.0%), were less frequently selected but still recognized for their relevance.

The most endorsed strategy was the use of tools with built-in text-to-speech (TTS) capabilities. TTS enhances reading fluency and comprehension by providing auditory input in conjunction with visual text. Alnahdi [15] reports that TTS tools significantly improve reading outcomes and student motivation among learners with cognitive impairments. The high frequency (221) and percentage (41.7%) affirm TTS as a cornerstone of digital accessibility in special education.

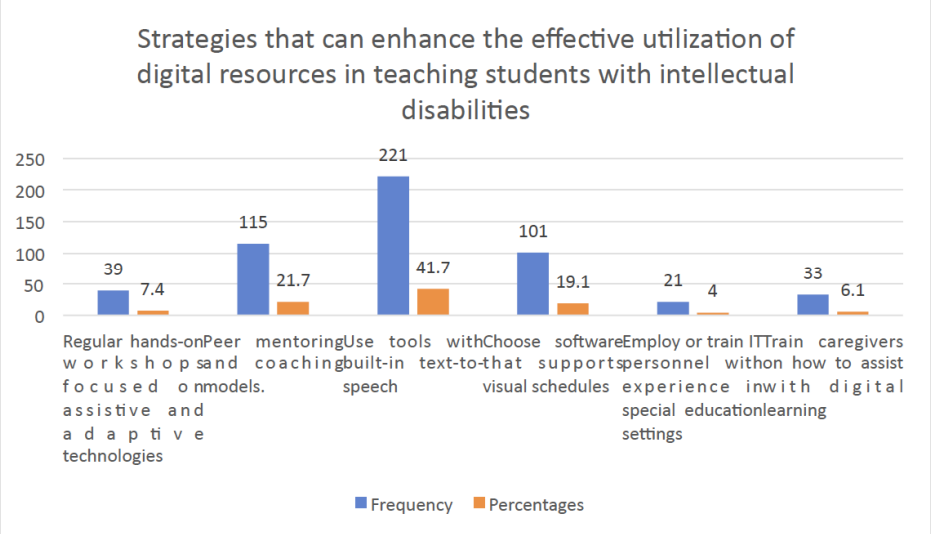

Figure 6: Strategies that enhance the effective utilization of digital resources in teaching students with intellectual disabilities.

Peer Mentoring and Coaching Models Peer mentoring ranked second in effectiveness (21.7%). This aligns with Benton *et al*. [22], who highlight the role of peer collaboration in fostering professional growth and technological competency among teachers. Coaching models help demystify digital tools and encourage sustained usage.

Visual Scheduling Software Tools that support visual schedules were identified by 19.1% of respondents as essential. Visual schedules help structure learning, reduce anxiety, and enhance task completion among students with intellectual and developmental disabilities. Khowaja *et al*. [26] found that such tools lead to improved behavioral outcomes and greater independence.

Professional Development and Caregiver Training While less frequently endorsed, hands-on workshops (7.4%) and caregiver training (6.1%) are pivotal in reinforcing the use of digital tools. Flanagan and Bouck [16] emphasize the need for ongoing professional development to support the integration of technology. Furthermore, caregiver training enhances continuity between home and school learning environments [27].

IT Support in Special Education Settings Only 4% of respondents highlighted the need for specialized IT personnel. However, the literature suggests that technical support tailored to special education is crucial. According to UNESCO [14], the lack of adaptive IT services can exacerbate inequities and hinder the efficacy of digital interventions.

Test of Hypothesis

The use of digital resources has no significant perceived impact on the learning outcomes of students with intellectual disabilities.

To examine the relationship between the use of digital resources and their perceived impact on the learning outcomes of students with intellectual disabilities, a Pearson's Product Moment Correlation Coefficient analysis was conducted. Table **2** presents the results of this analysis. The Pearson correlation coefficient (r = 0.167, p = 0.002) reveals a statistically significant but weak positive relationship between the frequency or extent of digital resource usage and educators' perceptions of their impact on student learning outcomes. The significance level ($p < 0.05$) indicates that the relationship is unlikely to have occurred by chance and is likely to be meaningful within the context of the study.

This finding suggests that the increased use of digital resources is associated with improved perceived outcomes in the academic and cognitive development of students with intellectual disabilities. While the effect size is modest, it suggests that digital tools contribute positively—albeit incrementally—to instructional effectiveness. This aligns with prior research emphasizing the supportive role of educational technology in special education. Alnahdi [15] and Flanagan and Bouck [16] note that technologies such as text-to-speech, visual aids, and learning management systems enhance accessibility, reduce learning barriers, and support individualized instruction. However, the modest strength of the correlation also suggests that technology alone is not a panacea; its effectiveness depends heavily on the quality of implementation, teacher competence, and contextual factors such as institutional support and student readiness. Furthermore, the low-to-moderate correlation suggests the presence of mediating variables—such as training, pedagogical integration, or student engagement—that could either strengthen or limit the impact of digital resource use. As UNESCO [14] warns, digital tools must be integrated within a broader, inclusive educational framework to yield meaningful learning improvements.

IMPACT OF DIGITAL INCLUSION ON THE LONG-TERM DEVELOPMENT OF INDEPENDENCE AND LIFE SKILLS

The findings of this study revealed a moderate level of availability but low and inconsistent use of digital

Table 2: Pearson's Product Moment Correlation Coefficient Analysis of the Relationship between use of Digital Resources and Perceived Impact on the Learning Outcomes of Students with Intellectual Disabilities (N=530)

Variables:	$\bar{\chi}$	S.D	r	P-value
Use of digital resources (x):	20.19	6.07		
			0.167	0.002
Perceived impact on the learning outcomes of students (y):	27.99	7.91		

*Significant at 0.05 level; df= 528.

resources in special education settings across Southern Nigeria. Although educators and caregivers acknowledge the potential benefits of digital tools, practical constraints, such as inadequate infrastructure, a lack of teacher training, and limited funding, continue to hinder their widespread utilization.

Beyond immediate academic benefits, the effective integration of digital tools holds substantial implications for the long-term development of students with intellectual disabilities. Digital inclusion is not merely a matter of classroom enhancement; it is closely tied to the broader goal of fostering independence and essential life skills. Tools like speech-generating devices, learning management platforms, and adaptive software can support not only communication and cognitive growth but also daily functioning and self-regulation—skills critical for autonomy in adulthood.

As noted by Alnahdi [15] and Flanagan and Bouck (2015) [16], digital tools that promote personalized learning and self-paced interaction contribute to the development of executive functioning skills. When consistently used, these tools help students with intellectual disabilities build routines, make choices, and manage simple tasks, all of which are essential for vocational training, social integration, and independent living.

Furthermore, digital inclusion aligns with global inclusive education goals by preparing students for participation in a technologically driven society. Without early exposure to digital resources, students with intellectual disabilities may face compounded exclusion in future work environments and community life. Therefore, strategic investments in accessible digital tools and teacher capacity-building are not only educational priorities but also social equity imperatives.

IMPLICATIONS TO STUDENTS WITH INTELLECTUAL DISABILITIES

The significant positive correlation between digital resource usage and perceived improvements in learning outcomes suggests that technology can act as a catalyst for greater educational access and student engagement. Tools such as text-to-speech, visual schedule software, and interactive applications help bridge cognitive and communication gaps commonly experienced by students with intellectual disabilities. For learners in Southern Nigeria, where educational resources may be limited, these technologies present a scalable means to enhance understanding and participation in classroom activities.

The integration of assistive digital tools enables more individualized instruction, which is essential for meeting the diverse learning needs of students with intellectual disabilities. For instance, the use of visual schedules and adaptive learning software fosters routine, reduces anxiety, and promotes task independence. This has long-term implications for building functional life skills and academic autonomy, especially in low-resource settings. The study highlights a clear need for professional development and caregiver training to support the effective implementation of digital resources. Teachers and caregivers in Southern Nigeria require structured training in both the technical and pedagogical dimensions of using educational technologies. This is essential not only to ensure proper tool usage but also to create a supportive learning ecosystem that reinforces digital instruction both at school and at home.

Despite growing interest in digital inclusion, the findings underscore systemic challenges that must be addressed, including inadequate IT support and limited access to assistive technology. Stakeholders—including government agencies, NGOs, and educational institutions—must invest in policy frameworks, infrastructure, and funding models that prioritize digital equity for students with intellectual disabilities. This includes subsidizing devices, expanding internet access, and embedding inclusive digital strategies into school development plans.

By enhancing digital access and usage, this research supports broader educational and social inclusion goals for students with intellectual disabilities in Southern Nigeria. Equitable access to learning technologies not only enhances academic outcomes but also contributes to reduced stigmatization, greater classroom integration, and improved self-esteem among students with disabilities. These social-emotional benefits are critical in promoting the full participation of these students in society.

CONCLUSION

This study concludes that while digital resources, particularly hardware tools like Smart Boards and assistive software, are moderately available in special education settings across Southern Nigeria, their actual use remains low and inconsistent. The underutilization of these tools is primarily due to infrastructural and financial constraints, with teacher capacity and systemic support also contributing factors. Despite

general stakeholder recognition of the value of digital tools, effective digital inclusion remains an underrealized goal. The weak but statistically significant correlation between digital resource use and perceived learning outcomes highlights both the potential and the limitations of current practices.

For students with intellectual disabilities, meaningful digital inclusion is essential not only for academic progress but also for the long-term development of life skills and independence. Addressing systemic barriers, expanding access, and enhancing educator competence is crucial to creating more inclusive, equitable, and empowering learning environments.

RECOMMENDATIONS

Based on the outcome of the study, it was recommended that;

1. The government should equip special education classrooms with a broader range of assistive digital tools.

2. The government should improve access to electricity and internet connectivity in both rural and urban areas.

3. The government should introduce budget lines for inclusive educational technology at the local and state levels.

4. The government should promote public-private partnerships and donor-funded initiatives to supply digital tools.

5. The government should integrate digital pedagogy for special education into teacher training colleges.

6. Government should provide continuous professional development through workshops, peer mentoring, and coaching.

CONFLICTING INTERESTS

The authors hereby declare that there is no conflicting interest. The publishers have been instructed to proceed with the publication of the paper.

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