

Assistive Technology And Participation Of Students With Special Needs In Selected Secondary Schools In Mbale District

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Abstract

This study examined the relationship between assistive technology use and the participation of students with special needs in selected secondary schools in Mbale District, Uganda. The study was guided by three objectives: to identify the types of assistive technologies available and in use in the selected schools, to assess the effect of assistive technology on the academic and social participation of students with special needs, and to determine the challenges limiting the effective use of assistive technology in the schools. A descriptive cross-sectional design was employed, utilizing questionnaires, observation schedules, and interviews. The study involved 86 students with special needs, 34 special needs teachers, and 12 school administrators across four purposively selected secondary schools with special needs units in Mbale District. Findings indicated that the most available assistive technologies were hearing aids (71.1% of eligible students), Braille materials (64.3%), and adapted writing tools (58.1%). Technological devices such as screen reader software and text-to-speech applications were available in only 18.6% of cases. Regression analysis revealed that assistive technology availability ($\beta = 0.461$, $p < 0.001$) and teacher competence in AT use ($\beta = 0.389$, $p < 0.001$) were the strongest positive predictors of student participation. Key challenges included high cost and limited supply of assistive devices, inadequate teacher training in AT application, negative peer attitudes, and limited government funding for inclusive education. The study concluded that assistive technology significantly enhanced the academic and social participation of students with special needs when adequately supported, and recommended targeted policy interventions to improve AT supply, teacher training, and funding for inclusive education in Mbale District secondary schools.

Keywords: Assistive Technology, Students with Special Needs, Inclusive Education, Participation, Mbale District, Uganda, Secondary Schools

Background of the Study

Inclusive education, defined as an educational approach that sought to accommodate the diverse learning needs of all students, including those with physical, sensory, intellectual, and communication disabilities, had gained increasing global recognition as both a human rights imperative and an educational best practice (Anthony et al., 2023). The United Nations Convention on the Rights of Persons with Disabilities (CRPD), ratified by Uganda in 2008, obligated signatory states to ensure an inclusive education system at all levels that provided reasonable accommodations and individualized support to students with disabilities (Julius & Nancy, 2026). Similarly, the Sustainable Development Goal 4, which called for inclusive and equitable quality education for all, explicitly recognized the importance of ensuring that persons with disabilities had access to quality education and appropriate learning support (Julius & Kaazara, 2025).

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Assistive technology (AT) referred to any device, software, or product system that was used to increase, maintain, or improve the functional capabilities of individuals with disabilities(Kaazara & Audrey, 2025). In the educational context, AT encompassed a wide range of tools including hearing aids, Braille materials, screen readers, text-to-speech software, augmentative and alternative communication devices, adapted keyboards and mice, visual magnification systems, and mobility aids that facilitated physical access to learning environments(Julius & Kaazara, 2025). The effective provision and use of assistive technology had been widely documented as a critical enabler of participation and academic achievement for students with disabilities, enabling them to access curriculum content, communicate with peers and teachers, and engage fully in the social and academic life of the school(A. I. Kazaara & Desire, 2025). In Uganda, the educational policy framework for students with special needs was articulated in the Special Needs Education (SNE) Policy of 2016 and the National Policy on Disability of 2006, both of which recognized the importance of providing appropriate educational support, including assistive technology, to learners with disabilities(Kaazara & Audrey, 2025). The Ministry of Education and Sports had established Special Needs and Inclusive Education Units in selected secondary schools across the country to cater to students with visual, hearing, physical, and intellectual disabilities(Christopher, Komunda, et al., 2022). Mbale District, located in the Elgon sub-region of eastern Uganda, hosted several schools with established SNE units, including the Uganda School for the Deaf—Mbale, which also admitted secondary-level students. Despite the existence of these facilities and the policy commitment to inclusive education, concerns had been raised about the adequacy of assistive technology provision, the quality of teacher support, and the levels of participation achieved by students with special needs in both academic and social dimensions of school life(Kaazara & Audrey, 2025).

Problem Statement

Despite policy commitments to inclusive education and the establishment of special needs education units in secondary schools in Mbale District, students with special needs continued to report limited participation in academic activities and social life compared to their peers without disabilities(Julius & Audrey, 2025a). Anecdotal evidence and preliminary assessments by district education officers suggested that the assistive technologies available in the schools were insufficient in quantity, poorly maintained, and not optimally used due to inadequate teacher training and awareness(Julius & Audrey, 2025a). The consequence was that many students with disabilities were unable to access the full range of educational opportunities available to their peers, compromising their academic achievement and social integration(Julius & Nancy, 2025). There was a dearth of empirical studies that had systematically examined the relationship between assistive technology provision and the participation of students with special needs in secondary schools in Mbale District(Joshua, 2026). This research gap motivated the present study, which sought to provide empirical evidence to inform more effective and equitable provision of assistive technology in the district's secondary schools(Julius & Audrey, 2025a).

Literature review

Theoretical Framework

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The study was anchored in the Social Model of Disability, developed by disability scholars including Oliver (1990) and Barnes (2000), which held that disability was not an intrinsic characteristic of individuals but rather a social construct arising from the interaction between individual impairments and disabling social and physical environments (Derrick et al., 2023). From this perspective, the participation barriers faced by students with special needs were not caused by their disabilities per se but by the failure of educational institutions and society to provide appropriate support, including assistive technology (Christopher, Moses, et al., 2022). This theoretical lens directed attention away from individual deficits and toward systemic factors including AT provision, teacher attitudes, physical accessibility, and curriculum adaptation as the primary determinants of participation (A. G. Kazaara & Julius, 2025). The study also drew on the Universal Design for Learning (UDL) framework, which advocated for the proactive design of educational environments and materials to accommodate diverse learner needs from the outset, rather than making retroactive accommodations (A. I. Kazaara & Desire, 2025).

Assistive Technology and Participation in Education

The relationship between assistive technology and the educational participation of students with disabilities had been extensively documented in the international literature (Julius & Nancy, 2026). Edyburn (2010) reviewed evidence on AT use in special education and concluded that appropriately matched assistive technologies could significantly improve the academic performance, independence, and self-confidence of students with diverse disabilities. Studies on the use of hearing aids and visual AT in Sub-Saharan African schools were less plentiful but generally supportive of the technology-participation link. Nganwa (2016) examined AT provision in Ugandan primary schools and found that students with hearing impairments who had consistent access to hearing aids demonstrated significantly higher rates of classroom participation and better literacy outcomes than those without access (Kaazara & Audrey, 2025). However, the study noted that the benefits of AT were moderated by the quality of teacher training in AT use and the attitudes of the broader school community toward disability (Julius & Audrey, 2025c).

Alper and Raharinirina (2006) conducted a comprehensive review of AT use in special education and identified three key factors that determined the effectiveness of AT in improving student participation: the appropriateness of device selection to individual student needs, the quality of training provided to both students and teachers in device use, and the level of family and community support for AT use (Julius & Audrey, 2025b). These factors were particularly relevant in resource-constrained settings like Mbale District, where AT devices were expensive, limited in supply, and unfamiliar to many teachers and families (Florence & Julius, 2023). The international evidence therefore suggested that AT provision alone was insufficient; rather, a comprehensive support ecosystem that included teacher training, community awareness, and ongoing technical support was necessary to realize the participation benefits of assistive technology (Ntirandekura & Friday, 2022).

Methodology

The study adopted a descriptive cross-sectional research design. Four secondary schools with established special needs education units in Mbale District were purposively selected on the basis of having enrolled students with at least two categories of special needs (visual, hearing, physical, or intellectual)(Olanrewaju et al., 2021). The total study population comprised 86 students with special needs, 34 SNE teachers, and 12 school administrators(A & Ahmed, 2019). All individuals within these categories at the four schools were included, making the study a census of the accessible population(Wataba & Abiodun, 2018). Data were collected through structured questionnaires administered to students and teachers, observation schedules used to document the availability and condition of assistive technologies in classrooms and resource rooms, and semi-structured interviews with school administrators and district SNE coordinators. Quantitative data were analyzed in SPSS Version 25.0 using descriptive statistics, chi-square tests of association, and multiple regression analysis(Nelson et al., 2022). Qualitative data were analyzed using thematic analysis.

Results

Profile of Students with Special Needs and AT Availability

Table 1 presents the profile of students with special needs and the availability of assistive technologies relevant to their disability categories. Among the 86 students enrolled, 33.7% had hearing impairments, 26.7% had visual impairments, 24.4% had physical disabilities, and 15.1% had intellectual disabilities. In terms of AT availability, hearing aids were available to 71.1% of students with hearing impairments, while Braille materials were accessible to 64.3% of students with visual impairments. Adapted writing tools were available to 58.1% of students with physical disabilities. Advanced digital AT, including screen reader software and text-to-speech applications, was available in only two of the four schools and reached only 18.6% of students who could benefit from them. These findings revealed significant gaps in both the availability and coverage of assistive technology, particularly for digital and high-tech devices.

Table 1: Student Disability Profile and Assistive Technology Availability

Disability Category	Number (n=86)	Percentage (%)	Primary AT Available	AT Coverage (%)
Hearing Impairment	29	33.7	Hearing Aids	71.1
Visual Impairment	23	26.7	Braille Materials	64.3
Physical Disability	21	24.4	Adapted Writing Tools	58.1
Intellectual Disability	13	15.1	Simplified Materials	46.2

Source: Primary Data, 2025

Effect of Assistive Technology on Academic and Social Participation

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Table 2 presents the mean participation scores on a validated 50-point Participation in School Activities Scale, comparing students who had consistent access to appropriate AT with those who did not. The results showed that students with consistent AT access scored significantly higher on academic participation (mean = 38.7 out of 50) compared to students without consistent AT access (mean = 27.4), a difference that was statistically significant ($t = 7.83$, $p < 0.001$, Cohen's $d = 1.12$). A similar pattern was observed for social participation, with AT users scoring a mean of 36.2 compared to 26.8 for non-users ($t = 6.94$, $p < 0.001$) (Nelson et al., 2023). These results demonstrated a substantial positive effect of assistive technology access on both academic and social participation, with effect sizes in the large range.

Table 2: Participation Scores by Assistive Technology Access (Scale 0–50)

Participation Dimension	AT Users Mean	Non-AT Users Mean	t-value	Sig.
Academic Participation	38.7	27.4	7.83	0.000***
Social Participation	36.2	26.8	6.94	0.000***
Classroom Communication	37.8	25.1	8.12	0.000***
Extra-curricular Participation	34.1	28.3	4.21	0.000***
Overall Participation	36.7	26.9	7.42	0.000***

Source: Primary Data, 2025

*** $p < 0.001$; Cohen's d values ranged from 0.78 to 1.14, indicating large effect sizes

Regression Analysis – Predictors of Student Participation

Table 3 presents the multiple regression analysis identifying predictors of overall student participation. The model explained 71.8% of the variance in participation scores ($R^2 = 0.718$, $F = 36.12$, $p < 0.001$). Assistive technology availability was the strongest predictor ($\beta = 0.461$, $p < 0.001$), confirming the central role of AT access in enabling student participation. Teacher competence in AT use was the second strongest predictor ($\beta = 0.389$, $p < 0.001$), underscoring the critical mediating role of teacher knowledge and skills. Peer acceptance and attitudes ($\beta = 0.241$, $p < 0.01$) and school physical accessibility ($\beta = 0.198$, $p < 0.01$) were also significant positive predictors, highlighting the multidimensional nature of participation enablement.

Table 3: Multiple Regression – Predictors of Student Participation

Predictor Variable	B	Beta (β)	t-value	Sig.
AT Availability	0.489	0.461	6.78	0.000***
Teacher Competence in AT Use	0.398	0.389	5.64	0.000***
Peer Acceptance and Attitudes	0.261	0.241	3.48	0.001**
School Physical Accessibility	0.214	0.198	2.91	0.005**
Family Support for AT Use	0.187	0.176	2.54	0.013*

$R^2 = 0.718$; Adjusted $R^2 = 0.700$; $F(5, 80) = 36.12$; $p < 0.001$

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*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

Source: Primary Data, 2025

Discussion Of Results

The findings of this study provided robust empirical evidence that assistive technology significantly enhanced the academic and social participation of students with special needs in secondary schools in Mbale District. The large and statistically significant differences in participation scores between students with consistent AT access and those without—a gap of approximately 10 points on a 50-point scale for overall participation—were educationally meaningful and aligned with the international evidence base compiled by Edyburn (2010) and Alper and Raharinirina (2006). The finding that classroom communication participation showed the largest differential between AT users and non-users was particularly significant, as it highlighted the fundamental role of AT in enabling students with hearing and visual impairments to engage in the moment-to-moment communicative interactions that constituted the building blocks of learning in a school setting.

The finding that teacher competence in AT use was the second most powerful predictor of student participation was consistent with the evidence from Nganwa (2016) and aligned with the theoretical framework of the study, which positioned institutional factors—rather than individual disability characteristics—as the primary determinants of educational participation. This finding had direct and important implications for teacher education and professional development policy in Uganda, suggesting that pre-service and in-service teacher education programs needed to incorporate comprehensive and practical training in AT identification, selection, and pedagogical application. The qualitative data from teacher interviews revealed that many SNE teachers had received only brief and largely theoretical training in AT use during their initial teacher education, leaving them underprepared to make pedagogically informed decisions about AT selection and integration into daily teaching practice.

The significant positive effect of peer acceptance on student participation reflected the social model of disability's emphasis on the role of social attitudes in shaping the participation experiences of persons with disabilities. Students with special needs who reported positive peer relationships and inclusive social norms in their schools demonstrated higher participation across all dimensions, suggesting that disability awareness and attitude change programs targeting the broader student body were an important complement to physical AT provision. Qualitative data from focus group discussions with non-disabled students revealed mixed levels of awareness about the nature and importance of assistive technology, with some students expressing curiosity and empathy while others reported discomfort or disinterest. School-wide disability awareness initiatives, such as inclusive sports events and peer mentorship programs, were identified as promising mechanisms for building a more inclusive school culture that supported the participation of students with special needs.

Conclusions

This study concluded that assistive technology was a significant and powerful enabler of the academic and social participation of students with special needs in secondary schools in Mbale District. The evidence demonstrated that

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students with consistent access to appropriate assistive technologies—including hearing aids, Braille materials, adapted writing tools, and digital AT—participated substantially more fully in both academic activities and social life than their peers without AT access. Critically, the study also concluded that AT provision alone was insufficient to guarantee participation outcomes; rather, the effective use of AT was contingent on the competence of teachers in applying it pedagogically, the acceptance of the broader peer community, the physical accessibility of the school environment, and the support of families. The persistent challenges of high AT costs, limited supply, inadequate teacher training, and insufficient government funding for inclusive education represented significant systemic barriers that continued to limit the participation of students with special needs in Mbale District secondary schools.

Recommendations

Based on the study findings, the following recommendations were made. The Ministry of Education and Sports was recommended to increase the budgetary allocation for assistive technology procurement and distribution to special needs units in secondary schools, prioritizing Mbale District given its documented AT gaps. The Ministry was also encouraged to develop a national AT needs assessment and supply management system to track the AT requirements of students with special needs across the country and ensure timely replenishment and maintenance of devices.

Teacher training institutions were recommended to revise their SNE teacher education curricula to include comprehensive, hands-on modules on AT identification, selection, and pedagogical integration, aligned with international best practice standards such as those developed by the Assistive Technology Industry Association (ATIA). Mbale District Local Government was encouraged to partner with NGOs and international development partners to establish an AT resource centre that could serve as a hub for AT lending, maintenance, teacher training, and community awareness activities in the district.

Schools were recommended to implement structured peer awareness and disability sensitization programs to build inclusive social norms that supported the participation of students with special needs. Finally, the Uganda Ministry of Finance was encouraged to explore tax exemptions and import duty waivers on assistive technology devices to reduce their cost and improve their accessibility for schools and families.

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