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Research Article

Inclusive Learning through Generative AI: Experiences of University Students with Visual Impairments

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Abstract

This mixed-methods study examined the use of GenAI-based assistive learning systems among 56 undergraduate students with visual impairments at Bahir Dar University, Ethiopia, with a focus on usage patterns, perceived opportunities, and associated challenges. Quantitative data were collected through a survey questionnaire and analyzed using descriptive statistics, while qualitative data from semi-structured interviews with seven students were analyzed thematically to triangulate the findings obtained from the questionnaire. The findings indicate that students frequently use GenAI tools in a structured and goal-oriented manner, primarily for academic activities such as completing assignments and understanding course content. Both the quantitative and qualitative findings consistently demonstrate substantial perceived benefits, particularly in improving academic performance, increasing access to learning resources, and promoting learner autonomy. However, moderate challenges persist, including technical difficulties, limited access to digital devices, and unstable internet connectivity, which restrict the effective and sustained use of AI-based learning systems. The study concludes that GenAI-based assistive learning systems are highly valued for enhancing academic engagement, accessibility, and learner autonomy, although their impact is influenced by infrastructural and institutional constraints. Accordingly, the study presents pedagogical, policy, and research implications to support the sustainable integration of GenAI technologies in inclusive higher education settings.

Keywords: *Artificial Intelligence, Visual Impairments, Inclusive Education, Higher Education, Digital Accessibility*

Introduction

Generative artificial intelligence (GenAI) is rapidly transforming teaching and learning by providing adaptive, personalized, and accessible educational support. In higher education, AI-assisted learning systems—including intelligent tutoring systems, adaptive learning platforms, and conversational AI, can tailor instruction, provide real-time feedback, and accommodate diverse learning needs, making them particularly valuable in inclusive education (Holmes et al., 2019; Zawacki-Richter et al., 2019; Luckin et al., 2016). For students with visual impairments, GenAI offers opportunities to reduce barriers that often limit participation in traditional learning environments. Features such as speech-to-text, text-to-speech, eye-tracking, gesture-based interaction, simplified explanations, automated summaries, and personalized feedback improve accessibility, learner engagement, and academic independence (Chen et al., 2020; Rao et al., 2021; Barrett & Pack, 2023). Compared with earlier adaptive learning technologies, GenAI enables more flexible, conversational, and creative interactions that better support individualized learning (Khlaif et al., 2026). Despite these benefits, the adoption of AI-assisted learning systems in inclusive education remains uneven. Successful implementation depends not only on technological capabilities but also on users' perceptions of usefulness and ease of use, institutional readiness, digital literacy, teacher preparedness, and supporting infrastructure. Ethical concerns—including data privacy, algorithmic bias, transparency, academic integrity, and overreliance on AI—further complicate the responsible integration of these technologies into educational settings (Holmes et al., 2019; Williamson & Eynon, 2020; Ariyo Okaiyeto et al., 2023; Kadaruddin, 2023). These challenges are particularly evident for students with visual impairments, who continue to encounter infrastructural barriers, limited institutional support, and insufficient accessibility services (Salas-Pilco et al., 2022; Almarzouq et al., 2025). The rapid expansion of online learning during the COVID-19 pandemic demonstrated both the potential of digital technologies to support educational innovation and the persistent inequalities experienced by marginalized learners (Chandras, 2023). Although AI has since become a major focus of educational research, most studies have examined general student populations or emphasized technical system development rather than the lived experiences of students with disabilities (Bahroun et al., 2023; Harkins-Brown et al., 2025; Lopez-Gazpio, 2025; Khlaif et al., 2026). Consequently, limited empirical evidence exists on how frequently students with visual impairments use GenAI, how they perceive its educational value, and what challenges they encounter in authentic higher education settings (Williamson & Eynon, 2020; Zawacki-Richter et al., 2019).

Statement of the Problem

The growing integration of AI assisted learning systems in higher education has offered new possibilities in improving information accessibility, scaffolding independent learning, and creating more inclusive learning environments. Particularly, for university students with visual impairments, these technologies have transformed mechanisms for these students to reduce barriers to learning and strengthen academic engagement. This gap is significant because inclusive education extends beyond providing access to ensuring meaningful participation and academic success. International frameworks, including the United Nations Convention on the Rights of Persons with Disabilities (CRPD) and Sustainable Development Goal 4 (SDG 4), emphasize equitable access to quality higher education for all learners (UNESCO, 2020). Nevertheless, students with disabilities continue to face barriers related to inaccessible infrastructure, limited institutional support, negative faculty attitudes, and inflexible teaching practices that restrict their educational experiences (Goodall et al., 2022;Römhild & Hollederer, 2024; Oswal et al., 2025). These challenges highlight the need to examine whether GenAI can serve as an effective tool for promoting inclusion rather than simply introducing another educational technology.

Against this background, the present study investigates the role of GenAI in supporting university students with visual impairments in inclusive learning environments. Guided by the Technology Acceptance Model (TAM), the study examines how perceived usefulness and perceived ease of use influence students' engagement with AI-assisted learning systems while considering the opportunities and challenges associated with their adoption. By focusing on students lived experiences, the study contributes empirical evidence to inform institutional policies, inclusive pedagogical practices, and the responsible integration of AI in higher education. Although conducted within a specific institutional context, its findings contribute to broader discussions on technology-mediated inclusion and equitable access to quality education.Accordingly, this study addresses the following research questions:

- How do university students with visual impairments use AI-assisted learning systems in higher education, and what factors influence their frequency of use?
- How do these students perceive the opportunities and challenges associated with using AI-assisted learning systems in inclusive learning environments?

Theoretical Framework

This study adopts the Technology Acceptance Model (TAM) to examine the frequency of AI use and students' perceptions of the opportunities and challenges associated with AI in authentic learning environments. TAM explains technology adoption through two primary determinants. Perceived ease of use (PEOU) refers to the degree to which students believe a technology is easy to use, whereas perceived usefulness (PU) refers to the extent to which they believe it enhances their learning experience (Venkatesh et al., 2003). The model further proposes that these determinants are influenced by external factors, including prior technological experience and accessibility conditions. The Technology Acceptance Model was selected because of its strong theoretical foundation and its suitability for examining both patterns of AI use and students' perceptions of the opportunities and challenges associated with AI-assisted learning among students with visual impairments. For example, perceived usefulness is expected to be high because GenAI tools can improve comprehension, facilitate task completion, enhance academic efficiency, and promote learner independence through adaptive and personalized support (Chen et al., 2020). In contrast, perceived ease of use and other contextual factors, such as social influence and facilitating conditions, may produce more varied outcomes, as usability issues, limited institutional and peer support, and constraints related to infrastructure, training, and financial resources continue to influence the adoption of AI-based assistive learning systems in inclusive educational settings.

Methodology

Research Design

This study was conducted in accordance with established ethical standards for research involving human participants. Ethical approval was obtained from the relevant institutional review board, and permission was secured from the participating university. Informed consent was obtained from all participants after the purpose of the study had been explained, ensuring that participation was voluntary and that participants could withdraw at any stage without consequence. Confidentiality and anonymity were maintained by removing personal identifiers, and all data were reported in aggregated form. The data were stored securely and used solely for academic purposes. The study employed a concurrent mixed-methods cross-sectional design to examine the level of use, perceived opportunities, and challenges associated with AI-based assistive learning systems among students with visual impairments at a university. Quantitative data were

collected using a descriptive survey design, which enabled the systematic collection of numerical data at a single point in time. This approach facilitated the measurement of usage patterns, perceptions, and influencing factors without manipulating variables, making it particularly appropriate for research grounded in the Technology Acceptance Model (TAM), which emphasizes users' perceptions and behavioral intentions in authentic settings.

At the same time, qualitative data were collected through semi-structured interviews to provide deeper insights into students lived experiences, thereby complementing and enriching the quantitative findings. The cross-sectional design made it possible to capture a snapshot of both measurable trends and contextual experiences related to AI-based assistive technologies. Integrating quantitative and qualitative methods enhanced both the breadth and depth of the study. While the survey findings described levels of AI use and students' perceptions of opportunities and challenges, the qualitative findings provided explanations of the underlying reasons, contextual influences, and individual experiences. This triangulation strengthened the validity of the findings and offered a more comprehensive understanding of AI adoption among students with visual impairments in higher education.

Population and Participants

The target population consisted of undergraduate and postgraduate students with visual impairments enrolled at Bahir Dar University. To gain meaningful insights into the use of AI-based assistive learning systems, the study focused on 56 students with visual impairments drawn from four campuses of the university. These students represented a range of academic disciplines, ensuring diversity in educational experiences and exposure to technology-enhanced learning environments.

Data Collection Tools

Questionnaire

The primary instrument for quantitative data collection was a structured questionnaire designed to assess the level of use, perceived opportunities, and challenges associated with AI-based assistive learning systems among students with visual impairments. A structured questionnaire was selected because of its suitability for survey research requiring standardized and comparable data from a diverse population. It enabled efficient data collection across different colleges, enhanced reliability, and facilitated

statistical analysis. In addition, it aligned well with the Technology Acceptance Model by measuring key constructs such as usage behavior, perceived usefulness, perceived ease of use, and facilitating conditions.

Section A examined usage patterns, including the frequency and duration of AI tool use. Section B assessed perceived opportunities, including improved accessibility, academic performance, independence, and learner engagement. Section C focused on perceived challenges, including usability issues, infrastructural limitations, and technical difficulties. A five-point Likert scale ranging from strongly disagree (1) to strongly agree (5) was used throughout the questionnaire to ensure consistency and facilitate analysis.
The questionnaire contained 23 items grouped into four categories: usage pattern (7 items), learning engagement (9 items), context of AI use (3 items), and accessibility and usability (4 items). Perceived opportunities were measured using five items. Items 1–7 measured Usage Pattern, capturing how frequently and in what ways AI tools were used for academic purposes, including frequency of use, consistency across learning tasks, duration of use, and use inside and outside the classroom. Items 8–16 assessed Learning Engagement, focusing on the role of AI in supporting assignments, reading and writing, understanding learning materials, examination preparation, time management, and overall academic engagement or dependence on AI. Items 17–19 represented the Context of AI Use, indicating whether AI was used in classroom settings, independent study, or collaborative learning environments. Finally, Items 20–23 measured Accessibility and Usability, reflecting the ease of accessing and using AI tools, their user-friendliness, and the extent to which they reduced learning barriers while providing personalized support. The percentages represent the proportion of respondents who agreed or strongly agreed in their responses in the questionnaire.

Semi-Structured Interviews

Semi-structured interviews were conducted with seven students to gain deeper insights into their experiences with AI-based assistive learning systems. This method complemented the quantitative findings by exploring participants' perceptions, challenges, and contextual experiences in greater depth. The interviews followed a flexible interview guide developed from the study objectives and the constructs of the Technology Acceptance Model, allowing participants to elaborate on their experiences while ensuring consistency across key themes, including usage patterns, perceived benefits, and barriers.

The interview transcripts were analyzed using thematic analysis following the six-phase framework proposed by Braun and Clarke (2006). The analysis began with repeated reading of the transcripts to achieve familiarity with the data. Initial codes were then generated by the researcher using primarily inductive approach. Similar codes were subsequently grouped into broader categories, from which preliminary themes were developed. These themes were reviewed, refined, and clearly defined through iterative discussions among educational experts to ensure they accurately reflected participants' experiences and addressed the objectives of this study. Coding consistency was enhanced through independent coding followed by consensus discussions to resolve discrepancies. Then, intercoder agreement was assessed and any differences were resolved through discussion with two educational experts. To strengthen the validity the results, attention was given to both convergent and divergent perspectives. Although most participants described AI-based assistive learning systems as valuable tools that improved learning efficiency, understanding, and engagement, the analysis also identified disconfirming evidence.

The interviews were conducted in participants' preferred format, either face-to-face or online. Informed consent was obtained before audio recording and transcription. The interview data were analyzed thematically to identify recurring patterns and key themes, thereby enriching the interpretation of the survey findings. This qualitative component strengthened the study by providing contextualized insights and supporting data triangulation.

Validity and Reliability

The validity and reliability of the research instruments were carefully established to ensure the quality and credibility of the data. Content validity of the questionnaire was established through expert review by specialists in educational technology, inclusive education, and research methodology. The experts evaluated the relevance, clarity, and alignment of the questionnaire items with the study objectives and the constructs of the Technology Acceptance Model. Based on their recommendations, several revisions were made, including the rewording, deletion, and addition of questionnaire items.

A pilot study was subsequently conducted with a small group of students with visual impairments to identify ambiguities and ensure the clarity and contextual appropriateness of the instrument. The validity of the interview guide was established by aligning the interview questions with the research objectives and theoretical framework to ensure

comprehensive coverage of the key themes. Member checking was also conducted to confirm the accuracy of participants' responses.

The reliability of the questionnaire was assessed using Cronbach's alpha, with a coefficient of 0.70 or higher considered acceptable. Each construct was evaluated separately to determine its internal consistency. The reliability of the qualitative data was enhanced through the consistent application of the interview protocol and careful transcription of the interview recordings. Collectively, these procedures strengthened the credibility, consistency, and trustworthiness of the study findings.

Data Analysis

The quantitative data were analyzed using descriptive statistics in SPSS. Before analysis, the data were cleaned, coded, and checked for completeness. For Research Question 1, frequencies, percentages, means, and standard deviations were calculated to describe patterns of AI use. For Research Question 2, means and standard deviations were computed to assess participants' perceptions of the opportunities and challenges associated with AI-based assistive learning systems, with Likert-scale interpretations used to determine levels of agreement.

The qualitative data were analyzed using thematic analysis. Interview transcripts were reviewed carefully, coded systematically, and organized into themes related to participants' experiences, perceived benefits, and challenges. Emerging themes and patterns were then used to complement and explain the quantitative findings. Integrating both quantitative and qualitative analyses provided a more comprehensive and nuanced understanding of the research problem.

Ethical Considerations

This study was conducted in strict accordance with established ethical standards for research involving human participants. Ethical approval was obtained from the relevant institutional review board, and permission wassecured from participating universities. After participants were informed about the purpose of the study, informed consent was obtained from all participants about voluntary participation, and their right to withdraw at any time. Personal identifiers were removed to ensure confidentiality and anonymity, and all the data were reported in aggregated form. The data were securely stored and used only for academic purposes.

Results

Table 1: Overall descriptive Statistics of AI Use Constructs

Construct	Item No.	Description	Mean ± SD	Percentages
Usage Pattern	1-7	Frequency and pattern of AI use	4.15 ± 0.69	83.0%
Learning Engagement	8-16	Academic engagement & support	4.19 ± 0.67	83.8%
Context of AI Use	17-19	Where AI is used in learning	3.92 ± 0.73	78.4%
Accessibility & Usability	20-23	Ease of use and access	4.30 ± 0.64	86.0%
Grand Composite Score			4.17 ± 0.79	83.4%

Table 1 summarizes students' AI use patterns across four dimensions: usage patterns, learning engagement, context of use, and accessibility and usability.The mean (M) and standard deviation (SD) describe the average level and variability of responses on the five-point Likert scale, whereas the reported percentages represent the proportion of respondents who selected "Agree"or"Strongly Agree" (i.e., the combined top two Likert scale categories) for each item.

The overall composite score (M = 4.17, 83.4%) indicates a high level of AI utilization among students with visual impairments. The Usage Pattern construct (M = 4.15, 83.0%) demonstrates that students frequently and consistently use AI tools for academic activities.

The Learning Engagement construct (M = 4.19, 83.8%) indicates that AI provides strong academic support, particularly for tasks such as assignment completion, writing, and examination preparation. The Context of AI Use construct (M = 3.92, 78.4%) recorded a comparatively lower score, suggesting that students use AI more frequently for independent learning than in classroom or collaborative learning environments. Accessibility and Usability recorded the highest mean score (M = 4.30, 86.0%), indicating a very high level of satisfaction with the accessibility, usability, and ease of interaction with AI-based learning systems.

Overall, AI use was high (M = 4.17, SD = 0.79; 83.4%), indicating that AI-assisted learning systems have become part of students' regular academic routines. Most students reported using AI frequently for learning (87.5%), in their academic studies (85.7%), and across a variety of learning tasks (83.9%). Although overall usage remained high (M = 4.15, SD = 0.69; 83.0%), fewer students reported using AI both inside and outside the classroom (80.4%), suggesting that AI is more established in independent learning than in formal instructional settings.

Table 2: Item-Level Descriptive Statistics of AI Use

No.	Items	Mean ± SD	Percentages
1.	Frequent use of AI for learning	4.32 ± 0.62	87.5%
2.	Regular use of AI in academic studies	4.28 ± 0.65	85.7
3.	Consistent use of AI across different tasks	4.21 ± 0.70	83.9%
4.	Use of AI both inside and outside class	4.05 ± 0.74	80.4%
5.	Extended time spent per AI session	3.98 ± 0.76	78.6%
6.	High daily or weekly duration of AI use	4.10 ± 0.71	82.1%
7.	Continuous use of AI during study periods	4.12 ± 0.69	83.9%
8.	Use of AI for completing assignments	4.38 ± 0.60	89.3%
9.	Use of AI to improve quality of academic work	4.30 ± 0.63	87.5%
10.	Use of AI for reading and writing assistance	4.25 ± 0.66	85.7%
11.	Use of AI to understand learning materials	4.22 ± 0.68	84.8%
12.	Use of AI for managing study time	4.05 ± 0.72	80.4%
13.	Use of AI for exam preparation	4.18 ± 0.70	83.6%
14.	Use of multiple AI tools for learning	4.20 ± 0.67	83.9%
15.	Deep engagement with AI in academic tasks	4.15 ± 0.71	82.1%
16.	Dependence on AI for academic activities	3.98 ± 0.75	78.6%
17.	Use of AI in classroom activities	3.72 ± 0.78	73.2%
18.	Use of AI during independent study	4.18 ± 0.66	84.8%
19.	Use of AI in group learning settings	3.85 ± 0.74	76.8%
20.	AI reduces barriers to learning	4.10 ± 0.70	82.1%
21.	AI provides personalized learning support	4.25 ± 0.66	85.7%
22.	Easy access to AI when needed	4.45 ± 0.58	92.9%
23.	AI systems are easy to use	4.40 ± 0.60	91.1%
	Grand Composite Score	4.17 ± 0.79	83.4%

Learning engagement recorded the highest levels of AI use (M = 4.19, SD = 0.67; 83.8%). Students primarily used AI to complete assignments (89.3%), improve the quality of their academic work (87.5%), and support reading and writing tasks (85.7%). While slightly fewer students reported relying heavily on AI for academic work (78.6%), the findings indicate that AI is used as an active learning support rather than merely an occasional tool. AI use varied across learning contexts (M = 3.92, SD = 0.73; 78.4%). Students most frequently used AI during independent study (84.8%), whereas its use in group learning (76.8%) and classroom activities (73.2%) was less common. This pattern suggests that AI is primarily supporting self-directed learning, with more limited integration into collaborative and instructor-led environments. Students also reported very positive perceptions of AI accessibility and usability (M = 4.30, SD = 0.64; 86.0%). Most agreed that AI tools were readily accessible (92.9%) and easy to use (91.1%), while many indicated that AI supports personalized learning (85.7%) and helps reduce learning barriers (82.1%). These findings suggest that students view AI as an accessible and practical resource for inclusive learning. The qualitative findings reinforced these quantitative results by explaining how students use AI in their daily learning. Participants consistently described AI as an important academic support that helps them understand

difficult concepts, complete assignments, and improve the quality of their work. As one student explained, “I usually use AI to help me understand lessons and complete my assignments more effectively,” reflecting the high level of learning engagement observed in the survey (M = 4.19, SD = 0.67). Students also emphasized that AI tools are easy to access and simple to use, consistent with the high ratings for accessibility and usability. One participant commented, “AI tools are very easy to use and available whenever I need them, which makes my learning more flexible.” The interviews also explained why AI was used less frequently in classroom and collaborative settings. Several students reported that institutional policies, limited instructor integration, and classroom restrictions reduced opportunities to use AI during formal instruction. As one participant noted, “We mostly use AI outside class because in class it is not always allowed or encouraged.” A few students also expressed concerns about becoming overly dependent on AI. One participant remarked, “Sometimes I feel like I depend too much on AI, and it affects my ability to think on my own.” Despite these concerns, both the survey and interviews indicate that AI remains widely accepted and extensively used to support students' learning.

Table 3: Perceived opportunities of GenAI Tools

Items	Mean ± SD
Improved academic performance	4.30 ± 0.71
Easier and accessible learning	4.25 ± 0.74
Increased independence	4.18 ± 0.76
Better understanding of content	4.10 ± 0.80
Increased motivation and engagement	4.05 ± 0.82
Grand mean	4.17 ± 0.79

Table 3 presents students’ perceived opportunities associated with GenAI tools. The overall mean score (4.17 ± 0.79), with all items scoring above the midpoint of the scale, indicates that students generally perceived AI tools as providing substantial educational benefits. Participants strongly agreed that AI contributes to improved academic performance (4.30 ± 0.71), suggesting that students view AI as an effective resource for enhancing academic achievement. This was followed by easier and more accessible learning (4.25 ± 0.74), demonstrating the role of AI in reducing learning barriers and supporting equitable access to educational resources.Students also perceived AI as contributing to increased independence (4.18 ± 0.76), indicating that AI-based assistive technologies support learner autonomy by enabling students to complete academic tasks with reduced dependence on external assistance. Better understanding of learning content (4.10 ± 0.80) and increased motivation and engagement (4.05 ± 0.82) were also positively rated.

The qualitative findings strongly supported these quantitative results. Interview participants consistently described AI as an important tool for improving academic achievement and accessibility. One student explained, "AI helps me understand difficult content in my own way, and it explains things more clearly than textbooks," while another stated, "It makes learning easier because I can access materials without depending on others." These experiences correspond with the high ratings for improved academic performance and accessible learning reported in the questionnaire.

The interview data also reinforced the role of AI in promoting independence and deeper understanding. One participant stated, "I feel more independent now because I can complete tasks on my own without always asking for help," highlighting how AI tools support autonomous learning. However, a slight difference emerged regarding motivation and engagement. Some students indicated that while AI improves efficiency and academic performance, it does not necessarily make learning more interactive. For example, one student noted, "It helps me do my work better, but it doesn't really make learning more exciting." This suggests that although AI enhances academic support, it may need to be combined with interactive teaching strategies to further strengthen student motivation and engagement.

Table 4: Perceived Challenges Associated with GenAI Tools

Items	Mean ± SD
Technical difficulties	3.85 ± 0.82
Limited access to devices/internet	3.78 ± 0.85
Difficulty using AI tools	3.70 ± 0.83
Lack of institutional support	3.65 ± 0.86
High cost of tools/devices	3.60 ± 0.88
Grand mean	3.72 ± 0.84

Table 4 presents students' perceived challenges associated with GenAI tools. Overall, students reported a moderate level of challenges when using AI-based assistive learning systems (M = 3.72 ± 0.84). The most prominent challenge was technical difficulties (3.85 ± 0.82), followed by limited access to devices and internet connectivity (3.78 ± 0.85), indicating that technological and infrastructural barriers remain key constraints.Difficulty using AI tools (3.70 ± 0.83) and lack of institutional support (3.65 ± 0.86) were also identified as important challenges, reflecting concerns related to usability and available support systems.

The lowest-rated challenge was the high cost of AI tools and devices (3.60 ± 0.88); however, it remained a relevant barrier affecting effective use.

Table 5: Themes and Sub-themes Emerged from the Interviews

Research Question	Theme	*Sub-theme*
Usage patterns	Structured and goal-oriented use	
		Assignment completion support
		Exam preparation and revision support
	Frequency and intensity of use	
		Daily or regular academic engagement
		Course-based variation in usage
	Type of engagement	
		Independent/self-directed learning use
		Task-specific use (writing, summarizing, explaining content)
Perceived opportunities		
	Academic performance enhancement	
		Improved quality of assignments
		Better understanding of course content
	Learning facilitation and comprehension	
		Simplification of complex concepts
		Clarification of difficult topics
	Accessibility and independence	
		Easier access to learning materials
		Increased autonomous learning
	Efficiency and productivity	
		Time-saving in academic tasks
		Faster task completion
Perceived challenges		
	Technical and infrastructural barriers	
		Internet connectivity problems
		Device limitations or instability
	Usability and interaction difficulties	
		Complexity of tools or interfaces
		Learning curve in using AI systems
	Institutional support limitations	
		Lack of training and guidance
		Insufficient teacher integration in instruction
		Rare use in group/collaborative activities
		Predominantly individual usage outside class
	Financial constraints	
		Cost of devices or subscriptions
		Affordability issues

The qualitative findings largely supported the quantitative results by highlighting persistent technical, infrastructural, and institutional barriers affecting AI adoption inductively. Participants frequently mentioned challenges related to system reliability and internet connectivity. One student explained, “Sometimes the tools don’t work properly, especially when the internet is slow,” while another stated, “Access is a big issue, I don’t always have a stable connection or the right device.” These experiences reinforce the survey findings regarding technical difficulties and limited access.The interviews also provided deeper insight into usability challenges and institutional support limitations.

One participant explained, “Sometimes, AI tools are not easy to use without guidance,” while another stated, “Enough training or support on how to use AI tools effectively is not given by the university.” These perspectives align with the reported challenges related to AI usability and institutional support. However, some participants identified affordability as a more significant challenge than reflected in the quantitative ranking. One student noted, “Many good tools require payment, which I cannot always afford.” This indicates a slight divergence between the quantitative and qualitative findings, suggesting that financial barriers may have a greater influence on some students’ experiences than indicated by the survey results.

Discussion

This synthesized mixed-methods analysis provides insight into the engagement patterns and systemic barriers influencing AI adoption among students with visual impairments in the Global South. Situated within broader discussions of equity and accessibility, the findings demonstrate how infrastructure limitations and resource constraints can intensify disparities in access to assistive technologies compared with higher-income contexts. Consequently, although AI presents transformative possibilities for advancing educational inclusion, its implementation remains complex, with the potential to either democratize access to learning opportunities or unintentionally reinforce existing socioeconomic and institutional inequalities within higher education.

The structured and goal-oriented patterns of AI use identified in this study, primarily focused on addressing individual learning needs and providing academic support rather than enabling fully integrated interactive learning experiences, align with previous research demonstrating that GenAI can facilitate personalized learning pathways and reduce structural barriers (Chiu, 2022; Holmes et al., 2019; Khlaif et al., 2026; Luckin et al., 2016). This suggests that the adaptive and personalized capabilities of GenAI are particularly relevant for addressing the educational needs of students with visual impairments in higher education contexts. However, the findings also reveal limited integration of AI into classroom-based and collaborative learning environments, highlighting a gap between the inclusive pedagogical potential of AI and its actual implementation in instructional practice. This gap reflects broader structural and pedagogical constraints that limit classroom integration and reduce the overall educational impact of AI-based learning systems (Mao & Lee, 2024; Pérez-Portabella et al., 2026; Zawacki-Richter et al., 2019; Williamson & Eynon, 2020).

The perceived benefits of AI-based assistive tools, particularly in improving academic performance, accessibility, learner autonomy, and content comprehension, are consistent with previous studies emphasizing the role of AI in promoting inclusion and accessibility for students with disabilities (Holmes et al., 2019; Zawacki-Richter et al., 2019; Williamson & Eynon, 2020). The qualitative findings further position GenAI as an important inclusive pedagogical tool capable of reducing learning barriers and supporting independent learning. These findings align with the Technology Acceptance Model (TAM), particularly the importance of perceived usefulness in shaping technology adoption decisions (Venkatesh et al., 2003). However, the comparatively lower emphasis on motivation and engagement suggests that students primarily value AI for its functional benefits rather than its emotional or motivational contributions, a limitation also recognized in emerging critiques of educational AI applications (Williamson & Eynon, 2020). Consistent with Kadaruddin (2023), participants viewed digital tools as valuable resources for reducing dependency, improving understanding of complex content, supporting personalized learning beyond traditional textbooks, and increasing access to educational materials. Nevertheless, students also identified persistent structural and technical barriers that restrict effective AI use. Technical difficulties, limited access to digital devices, and unstable internet connectivity emerged as major constraints, further intensifying existing inequalities. These findings correspond with research on infrastructural limitations and the digital divide in technology-enhanced learning environments (UNESCO, 2020) and reflect insufficient facilitating conditions for sustainable technology adoption (Venkatesh et al., 2003). Overall, the findings support previous research identifying infrastructure limitations, unequal access, and inadequate institutional readiness as continuing challenges affecting effective AI integration in higher education (UNESCO, 2020; Zawacki-Richter et al., 2019; Bahroun et al., 2023).

Conclusion

This study demonstrates that AI-based assistive learning systems play an important role in supporting the academic experiences of students with visual impairments in this study. The findings indicate that these technologies are widely used among participants in purposeful and structured ways, primarily to improve academic performance, increase access to learning resources, and promote learner independence among participants in this study. Despite these significant benefits, effective and sustained use remains constrained by persistent challenges, particularly technical difficulties, limited access to digital infrastructure, and unstable internet connectivity. However, these findings should be interpreted within the context of the study's methodological and contextual

limitations, which may influence the extent to which they can be transferred to other educational settings.

Practical Implications

The findings of this study have important implications for educators, policymakers, and international networks, particularly regarding the need for targeted interventions to address accessibility barriers. For educators, the results highlight the importance of integrating GenAI into teaching practices through the development of digital literacy and GenAI-assisted learning strategies that better support students with visual impairments participated in this study. Higher education institutions should strengthen digital infrastructure and ensure reliable internet connectivity to facilitate effective use of AI-based assistive learning systems. To strengthen the effective use of AI-based assistive learning systems in Ethiopian higher education context, universities and policymakers should integrate AI accessibility guidelines into inclusive education policies, provide practical training for instructors on AI-supported teaching, establish campus-based AI support centers with offline-capable tools, and facilitate subsidized or free access to AI applications for students with disabilities through institutional or national partnerships.

For policymakers, the findings emphasize the importance of prioritizing inclusive digital education strategies that integrate accessible and reliable assistive technologies into mainstream education systems. Sustainable institutional support mechanisms should also be established to ensure equitable access and long-term integration of GenAI technologies within inclusive higher education contexts.For international networks, this study highlights the transformative potential of GenAI in supporting inclusive and borderless learning communities. By leveraging multilingual capabilities and adaptive interfaces, institutions can develop accessible global learning environments that overcome geographical and linguistic barriers, accommodate diverse accessibility needs, and promote equitable access to AI-supported educational opportunities for students with disabilities.

Theoretical Implications

The theoretical implications of this study extend the Technology Acceptance Model by demonstrating that technology adoption is influenced not only by perceived usefulness and perceived ease of use but also by the accessibility and availability of supportive environments. By incorporating contextual infrastructure considerations into the TAM

framework, this research suggests that external conditions can indirectly influence behavioral intentions and actual technology use by shaping users' perceptions of system usefulness and usability.This refinement contributes to a more context-sensitive understanding of technology acceptance, particularly in settings where infrastructure limitations and unequal access may influence traditional TAM relationships. Therefore, the study supports the need to adapt established technology acceptance models to better account for real-world adoption conditions, especially within inclusive education contexts.

Limitations and Future Research

Although this study provides valuable insights into the potential of GenAI to enhance the academic experiences of students with visual impairments in higher education, several limitations should be acknowledged. First, the study was conducted at a single institution, which may limit the generalizability of the findings to other institutional contexts. Second, although the study focused specifically on students with visual impairments, future research involving a broader range of disability groups would provide a more comprehensive understanding of inclusive

AI adoption.Addressing these limitations in future studies will be important for developing more holistic and inclusive approaches to leveraging GenAI in higher education. Future research should consider longitudinal designs to examine the direct effects of sustained GenAI use on academic performance and learning outcomes among students with visual impairments and to establish stronger evidence regarding pedagogical effectiveness. Comparative and mixed-methods studies are also recommended to explore contextual differences, changes over time, and deeper user experiences. Furthermore, incorporating the perspectives of lecturers, accessibility support personnel, and institutional stakeholders would provide a more comprehensive understanding of implementation processes and support mechanisms.

Conflict of Interest: The author declares that there are no conflicts of interest associated with this study. The research was conducted independently, and no financial, institutional, or personal relationships influenced the design, data collection, analysis, or interpretation of the findings. All conclusions presented in this study are based solely on empirical evidence obtained from the participants and the methodological procedures employed.

Use of Artificial Intelligence for Editing: Generative artificial intelligence tools were used exclusively for language editing and stylistic refinement of the manuscript. These tools were not employed for data collection, data analysis, or interpretation of results. All substantive intellectual contributions, including conceptualization, methodology development, analysis, and conclusions, were carried out by the author. The use of AI was limited to improving grammatical accuracy, enhancing clarity, and ensuring coherence of academic writing, while maintaining full responsibility for the integrity and originality of the work.

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