

Impact of Assistive Technologies in Promoting Social Inclusion in Students with Visual Impairments

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Abstract

In education settings, the academic participation of learners with visual impairments continues to be inadequately addressed. Despite the fact that assistive devices like smart technologies, screen readers, and audio-based learning tools are recognised for improving access to academic programmes, their broader role in promoting social inclusion remains underexplored. Existing literature suggests that the mere availability of assistive technology is insufficient to ensure meaningful inclusion without supportive institutional, social, attitudinal, and pedagogical environments. This study adopted a descriptive research design to analyse the impact of assistive technology in education of individuals with visual impairment in advocating for academic involvement. A purposive sampling techniques were used to gather data through an interview schedule administered to 50 students with visual impairment, who are active users of assistive devices in education. The tool assesses experiences related to academic participation, peer interaction, communication, and perceptions of social inclusion. Gathered data were analysed with the help of Statistical Package for Social Sciences version 20 to identify relationships between assistive technology use and dimensions of social inclusion. The findings highlighted that assistive devices act as a significant facilitator of social engagement in education rather than academic support. Even though they could enhance accessibility, communication and equal opportunities, stigma, discrimination and social isolation are still a question mark. The study contributes to the discussions of inclusive education by providing insights for policies and institutional changes which can promote comprehensive technology-based inclusion of students with visual impairments.

Keywords: Assistive Technology, Social Inclusion, Inclusive Education, Academic Participation, Barriers, Accessibility

Introduction

A commonly known term is ‘Disability. It can be apparent or non-apparent and many can have temporary or permanent disability at a lot of instances in different ways. (WHO,2023). Disability is not just about medical conditions, it shows the complex interaction between an individual’s health condition and the barriers present in their environment, such as negative attitudes, inaccessible infrastructure, such as public buildings or lack of social support

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(WHO,2023; (Hartopo et al., 2025). Globally, about 1.3B individuals have certain disability, making up around 16% of the world's population (WHO, 2023). Despite their huge number, persons with disabilities continue to confront prevalent exclusion and injustice in many aspects of life. Individuals with disabilities are more likely to face poverty, limited access to education and employment, insufficient healthcare, and societal stigma (Dr. Sharma & Gupta, 2025). Whether at home, schools, or in employment settings, assistive technologies support individuals with disability in overcoming challenges and promoting independence. Assistive Technologies including basic tools like canes to complex smart devices like screen readers and navigation aids helps individuals to function independently in their day-to-day life.

The significance of this study lies in examining assistive technology not merely as a functional aid but as a determinant of social inclusion. Understanding how assistive technology influences social interactions, participation, and inclusion is essential for designing responsive policies and support systems since education and employment increasingly depend on digital platforms. Visual impairment has far-reaching effects across the life span, influencing education, employment, social engagement, mental health, and economic productivity(D'Andrea & Siu, 2015). Globally. About Two billion individuals encounter with near or distance vision impairment. Of these, around 1 billion cases are either preventable or have yet to be properly addressed (WHO, 2023). Visual impairment affects a person throughout the life span, limiting independence, social engagement, and access to education and employment, while also creating a significant economic burden globally ((Josilowski & Morris, 2019), Kaya & Boşnak, 2025). Assistive devices are for addressing these problems by enhancing daily functioning and promoting inclusion. Accessibility promotion to assistive tools can lead to attainment of the Sustainable Development Goals and to ensuring that no one is left behind. This is through enabling the inclusion and participation of them in families, community and all areas of society, including the political, economic and social spheres” (WHO, 2024). The studies on effective usage of assistive devices can improve social inclusion or not is still limited. The purpose of the study is to explore the popularity of assistive devices in learners with visual in education and analyses its relationship with social inclusion, particularly by focusing on academic participation and peer interaction.

Literature Review

Previous studies have covered the types of assistive tools used by persons with visual impairments in educational contexts. (Mbugua et al., 2022) carried out a mixed-methods study among 320 respondents in Nairobi and found the learners widely used braille machines and screen reading software, those and teacher guidance influenced their confidence in using such technologies. Similarly, (Daroni et al., 2018) mentioned about assistive devices like modified abacus, audio learning tools, braille-based games, OCR technologies, and MathTalk software as helpful in enhancing accessibility to mathematical concepts. Also, (Meshram, 2023) started innovations such as NavCane for navigation and SmartMedBox for managing medicines, which enhanced independence among visually impaired users. Studies by (Kuriakose et al., 2022) and (Zafar et al., 2022) also identified a large range of assistive devices using sensors, GPS, auditory feedback, etc. though some have certain limitations. These studies show that these devices have a significant role in promoting people with visual impairment in educational

settings.

Studies highlight that learners with visual impairments' academic participation have been enhanced by technology usage. (J.B. Dheesha, 2014) carried out a experimental study with 60 visually impaired students in Tamil Nadu and results highlighted that adapted experimental science aids significantly enhanced academic success, motivation, and classroom engagement compared to traditional teaching styles. Likewise, (Qasserras, 2024) indicated that visual learning aids can improve student participation, understanding, and critical thinking when customised to different modes of learnings. These findings could highlight that the academic engagement and learning experiences have been enhanced by usage of assistive learning tools and adapted teaching styles.

The assistive technologies also assist in building confidence and independent in youth with visual impairments. (Nombakuse & Pitso Tsibolane, 2023) have discovered that smart assistive technologies improved the independence, communication, and access to information among the visually impaired individuals since these technologies allowed them to become more independent in their educational activities. Similarly, emotional wellbeing, confidence, and self-reliance were improved in youth with visual impairments with the help of assistive devices through with some accompanying challenges that included frustration and social stigma (Muñoz & Abalorio, 2025). (Patel et al., 2025) also emphasized that new technologies based on machine learning models could promote the individuals' accessibility and autonomy. Overall, all these studies indicate the enhancement of effectiveness and confidence of the learners with visual impairment rather than mere learning facilitation.

Earlier researches show that assistive technologies can be used for people with visual impairments to enhance their social inclusion (Smith & Kelly, 2014). A research study conducted in Uganda found that braille machines, screen readers, audiobooks, and magnifiers usage enhanced the independence of students in the learning process and their engagement in the activities of learning (Peter and Tumwesigye, 2025). Similarly, (Nombakuse & Pitso Tsibolane, 2023) found that intelligent assistive devices assisted visually impaired people to become more independent, communicative, mobile and able to get information, yet affordability and social stigma still making limitations in comprehensive usage. Pundlik et al. (2023) named several smartphone apps that help with navigation, objects recognition, and digital accessibility to enhance daily operations of the visually impaired. Muñoz and Abalorio (2025) also reported that assistive technologies help to enhance confidence, autonomy and emotional satisfaction among adolescents with visual impairment; however, some adolescents are frustrated and anxious due to the technological interventions they have. In Indian context, . (Md Mousuf Raza & Alam, 2023) highlighted that screen readers, braille displays, audiobooks, and tactile graphics are devices that add on to inclusive learning method. The research, however, highlighted the fact that insufficiency of teacher training, inappropriate infrastructure, and expensive prices are some of the constraints that hinder proper assistive device utilization in schools.

Methodology

- To identify the different category of assistive tools utilized by visually impaired

students.

- To analyse the impact of these devices in enhancing academic participation and social inclusion

A descriptive research design was employed to examine the impact of assistive devices in social inclusion among learners with visual impairments in Chennai. The study highlighted on understanding the socio-economic influence, types of assistive technologies used in education, and the impact of assistive devices in social inclusion and academic engagement. The data were gathered from sixty-five learners with visual impairments from Chennai district, selected using non-probability purposive sampling method, those who met criteria of being students who have been using assistive devices over 6 months. The primary data was gathered using an interview schedule and the data were analysed with Statistical Package for the Social Sciences (SPSS) Version 20. Descriptive statistics such as frequency distributions and percentages were used to interpret the findings.

Results and Discussion

This part presents the findings of the study and discusses them based on the objectives of the study and previous studies. The findings focus on the socio demographic profile of the respondents, types of assistive technologies used, and their role in academic participation and social inclusion.

Table No: 1 Socio-Demographic Profile

S. no	Variables	Factors	Frequency	Percentage (%)
1	Age	18 to 29	48	73.8
		30 to 60	17	26.2
2	Gender	Male	43	66.2
		Female	22	33.2
3	Level of education	Primary Class	2	3.1
		Secondary Class	13	20
		Under-graduation	36	55.4
		Post-graduation &Above	10	15.4
		Professional Courses	4	6.2
4	Marital Status	Single	63	96.9
		Married	2	3.1
5	Monthly Household Income	Below Rs.10,000	7	10.8

		Rs.10,000 - Rs.30,000	41	63.1
		Rs.30,001 - Rs.60,000	8	12.3
		Rs.60,001 - Rs.90,000	1	1.5
		Not Applicable	8	12.3
6	Type of Visual Impairment	Low Vision	45	69.2
		Blindness	20	30.8
7	Ownership of Unique Disability Identity Cards	Yes	57	87.7
		No	8	12.3
	Availability of Disability Pension	Yes	36	55.4
		No	29	44.6
8	Duration of Assistive Technology Usage	6 months - 1 year	9	13.8
		1 - 2 years	18	27.7
		2 - 3 years	15	23.1
		3 - 4 years	5	7.7
		4 – 5 years	10	15.4
		More than 5 years	8	12.3

The above table indicates that a higher percentage (73.8%) of the respondents are in the age of 18 to 29 years, Majority (66.2 %) of the participants are Male, most of the respondents (55.4%) are under graduates, (96.9%) of the respondents are single, majority of the respondents (63.1%) are from lower to middle, larger portion of the respondents (69.2%) are low vision, A higher percentage of the respondents (87.7%) have UDID cards, however 44.6% of the respondents doesn't receive disability pension. Most (27.7%) of the respondents are using assistive technology for 1- 2 years. This shows that individuals with visual impairments are slowly gaining access to education as they are using assistive devices to assist them facilitate their learning. Nevertheless, the low coverage of disability pensions shows that the welfare schemes are not extensive despite the disability identification. These observations are addressed in the previous studies that emphasizes the facts socio economically disadvantaged were people with disabilities and they have difficulties in the way of accessing education and welfare programs (Dr. Sneha Sharma & Rishika Gupta, 2025). Overall, the results suggest that, although there is a slight improvement in institutional awareness of disability and assistive device accessibility among learners with visual impairment, there are still gaps in the areas of economic support and social inclusion initiatives in large (Miyauchi, 2020).

Table No: 2 Assistive Devices Used by Students with Visual Impairments in the Educational Settings

S. No.	Type of Assistive Device	YES		NO	
		Frequency	Percent (%)	Frequency	Percent (%)
1	Screen Readers	29	44.6	36	55.4
2	Braille	28	43.1	37	56.9
3	Smart Tech	36	55.4	29	44.6
4	Text-to-speech	33	50.8	32	49.2
5	Voice assistants	29	44.6	36	55.4
6	Audio Books	25	38.5	40	61.5

Some of the common assistive technologies used in education by the respondents are smart tech. (55.4%), text to speech (50.8%), screen readers (44.6) and voice assistants (44.6%). These technologies facilitate the access to digital content, learning resources and communication in learning settings. The usage of such tools implies that students with visual impairment are turning to digital and audio assisted technologies to support the learning process and their educational inclusion(Papadopoulos et al., 2024). These results are in line with previous research studies that have emphasized the importance of assistive technologies in aiding the learning requirements of the learners with visual impairments. For instance, Mbugua et al. (2022) found that assistive technologies commonly used by learners as braille machines and screen reader software enhanced their confidence and capacity to use technologies. Likewise, Daroni et al. (2018) studies that technology, including audio-base learning resources, OCR applications, and speech-assisted software, have increased the accessibility and independence of academic learning in students with visual impairments. Besides that, Zafar et al. (2022) and Kuriakose et al. (2022) also emphasized that the types of assistive technologies that utilize auditory feedbacks, sensors, and digital interfaces are also important to promote functional and educational needs of visually impaired individuals, yet these devices still need advancement to benefit the demand of users in comprehensive manner.

Table No. 3 Impact of Assistive Devices on Social inclusion of Students with Visual Impairments in Educational Settings

S. No.	Variables	Factors	Frequency	Percentage (%)
1	Confidence in Social Interaction in Education	Strongly Disagree	1	1.5
		Disagree	12	18.5
		Disagree	1	1.5
		Neutral	35	53.8

		Agree	16	24.6
		Strongly Agree		
2	Reduction of Social Isolation in Education Through Assistive Technologies	Strongly Disagree	25	38.5
		Disagree	28	43.1
		Disagree	2	3.1
		Neutral	9	13.8
		Agree	1	1.5
		Strongly Agree		
3	Efficient access to Learning Materials Using Assistive Technologies	Disagree	2	3.1
		Neutral	2	3.1
		Agree	26	40
		Strongly Agree	35	53.8
4	Inclusion in Group Discussions Assistive Technologies	Strongly Disagree	1	1.5
		Disagree	6	9.2
		Disagree	1	1.5
		Neutral	38	58.5
		Agree	19	29.2
		Strongly Agree		
5	Ability to Complete Tasks Within Comparable Timeframes Using Assistive Technologies	Strongly Disagree	1	1.5
		Disagree	5	7.7
		Disagree	1	1.5
		Neutral	35	53.8
		Agree	23	35.4
		Strongly Agree		
6	Equal Opportunities in Education with Assistive Technology Use	Disagree	6	9.2
		Neutral	2	3.1
		Agree	34	52.3
		Strongly Agree	23	35.4
7	Effective Communication in Educational Settings	Strongly Disagree	1	1.5
		Disagree		

	Using Assistive Technologies	Disagree	2	3.1
		Agree	39	60
		Strongly Agree	23	35.4
8	Availability of Appropriate Assistive Technologies for Inclusion in Education	Strongly Disagree	1	1.5
		Disagree	2	3.1
		Disagree	2	3.1
		Neutral	40	61.5
		Agree	20	30.8
		Strongly Agree		
9	Reduction of Physical or Environmental Barriers in Education Through Assistive Technologies	Disagree	2	3.1
		Neutral	1	1.5
		Agree	39	60
		Strongly Agree	23	35.4
10	Reduction of Stigma/Negative Attitudes Through Assistive Technology Use	Strongly Disagree	26	40
		Disagree	32	49.2
		Disagree	7	10.8
		Agree		
11	Reduced Experience of Discrimination in Education Due to Assistive Technologies	Strongly Disagree	27	41.5
		Disagree	33	50.8
		Disagree	5	7.7
		Agree		

The given table indicates that most of the respondents (53.8%) agreed that they experience confidence in social interaction within educational settings. Most respondents (53.8%) agreed that assistive technologies enable them to complete tasks within comparable timeframes. Similarly, (52.3%) agreed that the assistive tools usage provides educational chances equally. A higher percentage of respondents (60.0%) agreed that assistive technologies support effective communication in educational settings. Furthermore, (61.5%) reported agreement regarding the suitable assistive device availability for inclusive education. Most respondents (60.0%) also agreed that assistive devices usage reduces physical or environmental barriers in educational settings. In contrast, (49.2%) disagreed that assistive technologies reduce stigma or negative attitudes, and (50.8%) disagreed that assistive technologies reduce experiences of discrimination in education. These results suggests that assistive device usage are enhancing learning and increasing the accessibility to academic resources to students with visual impairments. (Pant et al., 2020)

These findings can be compared to the findings of several studies that highlight the pros of assistive devices usage in educational participation and inclusion. For instance, Jarbi (2024) found out that in higher education, assistive devices positively influence the accessibility to learning resources, classroom activities, autonomy, and social interaction between students with disabilities. Similarly, Gikandi et al. (2025) discovered that digital braille displays enhanced students' autonomy, academic activity, and access to learning materials, thus facilitating inclusion in the educational settings. Also, Mnyanyi (2023) noted that information, communication, and learning opportunities can be greatly expanded within individuals with visual impairments through the usage of ICT-based assistive tools like screen readers and adaptive software. Also, in a systemic review of Fernandez-Batanero et al. (2022) found that assistive technologies could improve accessibility and academic participation of learners with visual impairments in education (Regondola & Astorga, 2025).

Despite of the positive results, the findings also present some barriers encountered in social inclusion even though assistive technologies were used. A greater portion of the respondents did not agree with the fact that assistive technologies decrease social isolation (43.1%), stigma or negative attitudes (49.2%), and discrimination in education (50.8%). The findings provided indicate that assistive technologies can influence academic performance and access, but may not be able to eliminate more profound social obstacles in the form of stigma, discrimination, and attitudinal exclusion in educational settings. These results were in line with the findings of Jarbi (2024) and Gikandi et al. (2025), who stated that the continued and inclusive use of assistive technologies remains influenced by factors like limited training, high cost of technologies, and insufficient institutional support. On the whole, the results suggest that assistive technologies are significant in promoting academic engagement and accessibility, but the significant social inclusion is possible only with the help of other institutional support, awareness, and inclusive educational activities.

Conclusion

The study is mainly exploring the impact made on academic participation of learners with visual impairments by assistive device usage in Chennai. The results shows that as by facilitating equal access to assistive technologies and assistive devices enhance accessibility, communication, and educational engagement, however, their effect on decreasing stigma, discrimination, and social isolation are still limited. Social workers have a significant role in enhancing inclusive education by assisting to access assistive technologies and promoting visually impaired learners through awareness programs and inclusive practices withing educational settings. Government interventions are equally important to ensure appropriate provision, funding, accessibility of assistive technologies in educational institutions, along with enforcing inclusive educational policies and awareness of disability welfare schemes. NGOs, educational institutions, and society also have a crucial role in strengthening inclusive education by planning training on assistive technologies, promoting peer support systems, and creating awareness to reduce stigma and encourage changed positive behaviours to students with visual impairments.

The study concludes that assistive technologies act as a key element in promoting access to academic activities, communication, and equal opportunities among students with visual

impairments, thereby supporting inclusive education. Long-term social inclusion outcomes and institutional practices that can build up the efficient usage of assistive devices in inclusive educational settings are yet to be studied.

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