AI BASED ASSISTIVE TECHNOLOGIES IN THE CLASSROOM: A SYSTEMATIC LITERATURE REVIEW ON TRANSFORMING EDUCATION FOR STUDENTS WITH VISUAL IMPAIRMENTS

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Abstract

This study examines AI based Assistive Technologies and its role in enhancing the participation an overall experience of students with visual impairments in the classroom and educationalenvironment, it has been analysed into five key themes which are, personalized learning, accessibility and navigation, classroom communication and participation, real-time feedback and assessment, and teacher training. According to different research, multiple AI based tools such as screen readers, navigation devices and applications, smart glasses, and more have significantly improve the students participation by providing information and immediate support through accessible formats, these technologies enhances the student's independence and confidence which eventually enhance their classroom participation and overall experience. However, pedagogical and professional development has to be implemented for the teachers. The study concludes that while AI is a powerful tool for creating more inclusive and equitable learning environment, institutional support and training should be prioritize to bridge the gaps in educator knowledge and resources.

Keywords: Assistive Technology, Artificial Intelligence (A.I), Visual Impairment, Inclusive Education.

Objectives

The present study aims to explore and analysed literature on how AI based Assistive Technology facilitate educational transformation for students with Visual impairment. The objectives include:

- To explore the benefits of using AI based Assistive Technology in enhancing educational access and participation for students with Visual Impairment.

- Explore existing research, case studies, and best practices that demonstrate the practical implementation and effectiveness of AI based Assistive Technology in inclusive settings.
- To analyse how AI based Assistive Technology support personalized learning, accessibility, classroom participation, real-time feedback, and teacher professional development for students with Visual Impairments.

Methodology

This study applies a systematic literature review approach. Fourteen research articles published from 2022 to 2025 were selected using the following measures:

1. Inclusion criteria: Peer reviewed studies that focuses on AI based application for students with Visual Impairments.
2. Databases& sources: Google Scholar, Scopus, and Web of Science.
3. Analysis: The study was analysed into five key themes: (i) AI enabled Individualized Learning. (ii) Accessibility and navigation using AI. (iii) AI enhancing classroom participation and communication. (iv) Real time feedback and assessment tools. (v) Pedagogical adaptations and training.

AI enabled Individualized Learning

According to studies by Prabhu et al. (2024), Susanna Muradyan (2023), Chamath Samarawickrama et al. (2023), PrudhviNaayini et al. (2025), artificial intelligence is reforming personalised learning for students with Visual Impairments. By using innovations such as computer vision, Natural Language Processing (NLP), and wearable technology, AI devices like screen readers, smart glasses, navigation assistance provide access to educational materials independently. Application such as Seeing AI, and Google Lookout offer real-time explanations, reading documents, recognizing object advancing the independence and engagement of the user. Furthermore, AI based assistance convert visual resources into audio and tactile formats, which significantly improves understanding and inclusion. The collective findings of these studies shows that AI driven individualized learning is an extremely valuable approach to enable students with visual impairment to learn independently.

Accessibility and Navigationusing AI

According to recent studies by Aditya et al. (2025), Neelakantappa et al. (2025), Aniedu et al. (2025), and Jagadish et al. (2024), artificial intelligence is gradually improving accessibility for people with visual impairments. AI systems significantly improve a person’s ability to move around, independence day to day activity and their safety by combining advanced sensors, powerful processing, and a variety of feedback methods. One key innovation is Neuro Responsive wearable optics, which use high resolution cameras and

technology to identify objects, scenes and obstacles which is conveyed to the user through tactile feedback mechanisms such as vibrations or neurostimulation, which provide immediate and relevant signalsin real time.AI is also powering advanced navigation tools that use Bluetooth, GPS and audio tool that guides the users to navigate indoors and outdoors. These systems are often paired with mobile applications that offer a range of features such as colour and currency recognition, text to speech, barcode scanning. These AI based tools showcase how technology can provide individuals with visual impairments with independent and inclusive lifestyle in accessibility and Navigation through AI.

AI Enhancing Classroom Participation and Communication

Naayini et al. (2025) and Prabhu et al. (2023) in their studies shows the transformations provided by AI based assistive and digital technologies that improves the communication and participation in the classroom of students with visual impairment which works together to create an accessible learning environment. Microsoft Seeing AI, Google Lookout, and Be My Eyes are digital visual tools that provides real time support by identifying and recognizing text, objects, and scenes and describing it to the user through audio, as well as offering assistance remotely from sighted volunteers allowing independent interaction and participation withing the classroom. Natural Language Processing (NLP) applications such as JAWS Screen Reader and Natural Reader, alongwith voice assistance like Siri and Alexa, enables and enhance comprehension and hands-free communication. These systems also support Braille output which further increases the learning experience.In addition, there are wearable devices such as Envision Glasses or OrCamMyEye Pro which aid in visually impaired students to independently educate themselves as they provide audio descriptions, facial recognitions, text reading, and awareness to this environment.

In terms of accessibility of visual and printed materials, numerous tactile and digital resources such as EPUB and DAISY formats and refreshable Braille digital, as well as tactile graphic-makers like Swell-Form, PIAF, and Thermoform Machines, are available. Their ability to convert difficult and not easily comprehensible visual signals into touchable and audible format makes these devices all the more accommodating. Research shows that when people utilize these tools, their communication skills and their participation in society is enhanced. As a result, they become more confident, more independent, and co-operate well when learning with others- both in schools and with peers.

Real-time Feedback and Assessment Tools

Bhakiyasri (2024) and Dhakal et al. (2025) highlights that real-time feedback and assessment tools that are powered by Artificial Intelligence serve great importance in the educational development of students with visual impairment as they make learning much easier by providing immediate adjustment for each individual student in terms of their

needs. These integrated technologies can turn words into speech and can suggest words to make talking or typing faster, thus helping them communicate better through their own voices.

Similar to smart glasses and image recognition, vision-based systems assist visually impaired students in reading, identifying objects, and avoid obstacles. AI chatbots on learning websites are generated to quickly answer questions, explain lessons, and suggest helpful study materials. These sites additionally utilize smart quizzes and progress checks to immediately recognize errors made during learning sessions. Other tools, such as Mindomo make it simple for students to work together with audio and screen-reader support, while live online classrooms and data tools help teachers and students keep track of progress. Studies show that these AI tools make classrooms help students get more involved in class, feel more confident and experience better independent learning. It also helps teachersave time as it reduces repetitive tasks for instructions which in turn improves academic performance of students.

Pedagogical Adaptations and Training

Miao Ye et al. (2024) and Kevin Kai-Wing Chan et al. (2024) emphasize that using AI tools to help students who have visual impairment is not merely about introducing in new gadgets. They recommend that teachers adapt their teaching methods to reflect the demands and advancements of the current era. More attention must be given towards students taking part and interacting in lectures instead of passive teaching in addition to making use of AI tools to give feedback that matches each student's needs. It has been shown that the best training for teachers is hands-on, happens in real classrooms, and helps them pick the right tools, change lessons as required, and consider what is fair and what is right. Due to the reason that many teachers still require special training in terms of using AI tools in educational settings, proper and adequate support must be given to teachers in order to employ such new technologies.

Implications of the Study

- **For Teachers:** Organizing training programs that include the use of AI tools in teaching, with focus on hands-on learning and adjusting teaching methods.
- **For Schools and Colleges:** Educational institutions should support this integration by creating clear policies, providing adequate funding, and offering solid technical resources.
- **For Researchers:** There is a need for more real-world studies and long-term research to understand the long-term effects of AI-based systems on student learning.

- **For Education Policy:** Policymakers should create defined standards for using AI-based assistive technology in regular classrooms to ensure that all students have equal opportunities.

Conclusion

Recent studies show that AIbased assistive technology is altering education for students with visual impairments in a major way. These tools are not solely simple aids, they are crucial for making classrooms or learning environment more open, supportive, and empowering. Research in areas like personalized lessons, classroom access, better communication, real-time feedback, and teacher learning proves that these technologies help students grow more independent, confident, and successful at school. Examples of such devices include smart apps, wearable devices, and learning platforms enable to navigate their physical and digital worlds in addition to receiving immediate and customized assistance. It has also been highlighted that comprehension of lessons and grades have improved noticeably. However, for these benefits to reach the mass, teachers are demanded strong, ongoing, and effective training. Adjusting teaching styles and providing hands-on practice for education are crucial. Ultimately, combining new technology with adequate teacher training and steady facilitation from schools is the key for all students with visual impairment to get full benefit from AIpowered education.

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