CINEFORUM
ISSN: 0009-7039
Vol. 66. No. S3, 2026 (Special Issue 3)

AI-Enhanced Strategies for Supporting Students with Deafblindness: Towards an Inclusive and Multisensory Educational Framework.

Mohd Norazmi Nordin[1], Siti Noor Aneeis Hashim[2], Albert Feisal Ismail[3], Nazrul Azha Abu Hassan[4], Roslieza Rosli[5], Farhanah Mohd Noor[6], Juereanor Mat Jusoh[7]

[1] Faculty of Education, Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia.
[2] School of Education, Universiti Utara Malaysia, Malaysia.
[3] Faculty of Technology Management and Technopreneurship, Universiti Teknikal Malaysia Melaka, Malaysia.
[4] School of Creative Industry, Management and Performing Arts, Universiti Utara Malaysia, Malaysia.
[5] Fakulti Sains Sosial Gunaan, Pusat Pengajian Antropologi dan Dakwah, Universiti Sultan Zainal Abidin, Terengganu, Malaysia.
[6] Faculty of Business Management and Professional Studies, Management and Science University, Malaysia.
[7] Fakulti Perubatan, Universiti Sultan Zainal Abidin, Terengganu, Malaysia.

Abstract
The rapid advancement of artificial intelligence (AI) has created new possibilities for improving accessibility, personalisation, communication, and participation in education. However, the application of AI to students with deafblindness remains underexplored despite the complex barriers these learners encounter in accessing auditory and visual information. This conceptual review examines the potential of AI-enhanced strategies to support students with deafblindness and proposes an AI-Enhanced Multisensory Support Framework for Deafblind Education (AIMS-DB). Drawing upon recent scholarship on artificial intelligence in special and inclusive education, assistive technology, Universal Design for Learning (UDL), and human-centred AI, the paper identifies six interconnected dimensions of AI-supported deafblind education: AI-supported communication, adaptive and personalised learning, multimodal sensory transformation, intelligent environmental access, AI-assisted teacher decision-making, and ethical and human-centred implementation. Emerging technologies such as natural language processing, computer vision, speech recognition, generative AI, wearable technologies, and haptic interfaces could potentially transform inaccessible information into tactile, Braille, textual, auditory, or other individually accessible forms. Nevertheless, technological innovation alone cannot ensure inclusion. Significant challenges remain concerning algorithmic bias, accessibility, data privacy, technological reliability, digital inequality, teacher preparedness, and the limited representation of people with deafblindness in AI research and development. The paper argues that AI should augment rather than replace teachers, interveners, families, and human communication partners. The proposed AIMS-DB framework therefore positions AI as an intelligent accessibility mediator operating between learners and their educational environments. Future research should prioritise participatory design and empirical evaluation involving students with deafblindness to ensure that emerging AI technologies contribute to communication, learning, independence, agency, and meaningful educational participation....
Keywords: artificial intelligence; deafblindness; assistive technology; inclusive education; multisensory learning; personalised learning; special education; Universal Design for Learning.

Introduction

Artificial intelligence (AI) is rapidly reshaping contemporary education through developments in adaptive learning, natural language processing, computer vision, automated assessment, intelligent tutoring systems, learning analytics, robotics, and generative AI. Recent systematic reviews indicate that AI applications in special and inclusive education have expanded substantially, with emerging evidence suggesting potential benefits for personalisation, communication, academic learning, accessibility, and student engagement (Rice & Dunn, 2023; Voultsiou & Moussiades, 2025). More recent evidence further indicates that AI-based interventions can produce positive learning outcomes for students with disabilities, although the strength and methodological quality of the available evidence remain uneven (Paglialunga & Melogno, 2025; Zhang et al., 2026).

The significance of AI for students with disabilities extends beyond instructional efficiency. AI has the potential to operate as an accessibility mechanism capable of recognising, interpreting, transforming, and presenting information in alternative forms. This possibility is particularly important within special education, where barriers to participation may arise from mismatches between conventional learning environments and students' sensory, cognitive, physical, or communication characteristics. Internationally, access to appropriate assistive technology is increasingly regarded as an essential component of inclusion and participation. The World Health Organization and United Nations Children's Fund (WHO & UNICEF, 2022) emphasised that assistive technology can support education, communication, independence, and participation, while also highlighting substantial global inequalities in access to appropriate technologies.

One group for whom AI-supported accessibility warrants particular attention is students with deafblindness. Deafblindness involves the combined effects of hearing and visual impairment, producing educational and communication implications that cannot be adequately understood simply by adding the consequences of deafness to those of blindness. Restricted access to both auditory and visual information can influence communication, concept formation, social interaction, environmental awareness, mobility, incidental learning, and participation in educational activities. Consequently, students with deafblindness frequently require highly individualised combinations of tactile communication, Braille, augmentative and alternative communication (AAC), assistive technologies, environmental modifications, and support from teachers, interveners, interpreters, families, and other communication partners.

The emerging AI literature nevertheless remains disproportionately concentrated on broader disability categories. Reviews of AI applications for students with disabilities have identified substantial attention to learning disabilities, autism spectrum conditions, intellectual disabilities, and other relatively more frequently studied populations (Panjwani-Charania & Zhai, 2024; Rice & Dunn, 2023; Voultsiou & Moussiades, 2025). For example, Paglialunga and Melogno's (2025) systematic review of AI interventions for students with learning disabilities identified promising outcomes but also considerable methodological limitations. Similarly, Zhang et al. (2026) found a medium overall effect of AI-based interventions across 29 experimental and quasi-experimental studies involving students with disabilities, while calling for stronger attention to student agency in AI-mediated learning. In contrast, research examining AI specifically in relation to deafblindness remains extremely limited. An emerging example is the work of Dhanalakshmi et al. (2025), who developed a tactile learning assistive system integrating deep-learning techniques with Morse-code-based tactile communication for individuals with combined visual and hearing impairments. Such developments demonstrate technological possibilities, yet they also highlight the embryonic nature of AI applications specifically designed for deafblind learners.

This gap is significant because most mainstream AI systems remain predominantly visual, auditory, or text-screen dependent. Voice assistants assume that users can access auditory responses, computer-vision systems frequently communicate results through visual displays, and generative AI applications are generally designed around visual text interfaces. Technologies that are technically multimodal may therefore remain functionally inaccessible to individuals with combined hearing and visual impairments.

The critical issue is consequently not merely whether AI can be introduced into deafblind education, but how AI can be designed and implemented to mediate information across sensory modalities while respecting the communication preferences, agency, dignity, and individual characteristics of students with deafblindness. Against this background, this conceptual paper examines the potential contribution of AI-enhanced strategies to deafblind education and proposes an AI-Enhanced Multisensory Support Framework for Deafblind Education (AIMS-DB).

2. Deafblindness and the Complexity of Educational Access

2.1 Deafblindness as a Distinct Educational Condition

Deafblindness represents a distinctive educational condition because the interaction of hearing and visual impairments substantially alters how individuals obtain information from their surroundings. The educational implications are therefore qualitatively different from those associated with either hearing or visual impairment alone. Sighted and hearing learners acquire substantial information incidentally. They observe interactions, overhear conversations, recognise environmental changes, follow visual demonstrations, imitate peers, and independently explore their surroundings. When access to both distance senses is substantially restricted, these incidental learning opportunities can become fragmented or unavailable. Educational experiences may therefore need to be deliberately structured so that information ordinarily obtained visually or auditorily becomes available through alternative sensory and communication pathways.

Furthermore, students with deafblindness constitute an exceptionally heterogeneous population. Differences may occur according to the degree of sensory loss, age of onset, residual hearing and vision, communication history, cognitive characteristics, additional disabilities, educational experience, family context, and access to early intervention. Communication approaches may consequently include tactile sign language, adapted sign language, Braille, speech, objects of reference, symbols, gestures, AAC systems, haptic communication, or combinations of multiple approaches. This diversity makes standardised technological solutions particularly problematic. Rather than expecting learners to adapt to technology, effective AI-supported deafblind education requires technology to adapt to individual learners.

2.2 Communication, Information Access, and Participation

Communication is fundamental to learning, relationships, self-determination, and participation. For students with deafblindness, however, communication access can be complicated by the rapid and multimodal nature of ordinary classroom interactions. Teachers commonly speak while displaying visual information. Students respond spontaneously. Instructions change according to contextual cues. Classroom conversations involve several speakers. Videos combine speech, text, movement, and visual imagery. Environmental events may occur without explicit explanation. A learner with deafblindness may therefore receive only fragments of the information available to classmates. This issue has important implications for AI because contemporary AI technologies increasingly possess the ability to recognise speech, analyse text, identify objects, interpret images, detect environmental events, and transform information. The educational opportunity lies in connecting these capabilities with accessible output systems such as refreshable Braille displays, tactile interfaces, AAC technologies, and haptic devices. AI could consequently function not merely as an instructional tool but as an accessibility mediator between the learner and an otherwise inaccessible environment.

3. Artificial Intelligence, Assistive Technology, and Inclusive Education

The increasing convergence between AI and assistive technology is creating possibilities for technologies that respond dynamically rather than merely performing predetermined functions. Traditional assistive technologies frequently provide specific accessibility functions, whereas AI-enhanced systems may recognise patterns, predict needs, adapt content, interpret environmental information, or generate alternative representations. Recent reviews demonstrate growing applications of AI within special education. AI-supported interventions have been used for personalised instruction, communication assistance, intelligent tutoring, behavioural intervention, adaptive learning, robotics, and accessibility support (Rice & Dunn, 2023; Voultsiou & Moussiades, 2025). A systematic review by Panjwani-Charania and Zhai (2024), for example, identified applications including adaptive learning, intelligent tutoring, communication assistants, chatbots, interactive robots, and mastery-learning systems for students with learning disabilities.

Similarly, Paglialunga and Melogno (2025) reported promising outcomes from AI-supported interventions for students with learning disabilities, particularly personalised and adaptive systems. However, they cautioned that existing evidence was characterised by methodological weaknesses and substantial risks of bias. These findings suggest that optimism concerning AI should be accompanied by rigorous empirical evaluation. This caution is particularly relevant for deafblindness. Technologies designed for more common disability groups cannot automatically be assumed to transfer successfully to students with combined sensory impairments. The development of AI-enhanced deafblind education can also be informed by Universal Design for Learning. The current UDL Guidelines emphasise learner agency, multiple forms of representation, diverse methods of action and expression, accessible technologies, and the removal of exclusionary barriers (CAST, 2024). However, for students with deafblindness, multiple means of representation must extend beyond conventional combinations of text, audio, and visual media to incorporate tactile, haptic, Braille, symbolic, and other sensory-accessible formats. AI potentially strengthens this principle by enabling dynamic cross-modal transformation.

4. AI-Enhanced Strategies for Students with Deafblindness

4.1 AI-Supported Communication

Communication mediation represents one of the most promising applications of AI in deafblind education. Advances in automatic speech recognition and natural language processing enable spoken information to be converted rapidly into digital text. When integrated with refreshable Braille displays or other tactile technologies, such systems could provide students with greater access to classroom communication. A basic communication pathway could operate as:

Teacher Speech → AI Speech Recognition → Text Processing → Accessible Output → Refreshable Braille/Tactile Interface

AI could potentially extend this process by identifying speakers, extracting key information, simplifying language, summarising lengthy discussion, distinguishing questions from instructions, and prioritising urgent messages. Natural language processing could also facilitate communication across different modalities. A message entered through text, symbols, AAC, or another communication system might potentially be translated into a format accessible to another communication partner. Emerging technological research illustrates the feasibility of such cross-modal systems. Dhanalakshmi et al. (2025) developed an AI-supported tactile learning tool in which lip movements were converted into text using deep-learning techniques before being transformed into Morse-code-based tactile signals through a wearable device. Their system demonstrates how AI can function as an intermediary between information that is initially inaccessible and tactile information that can potentially be perceived by a person with combined sensory impairment. Nevertheless, AI-mediated communication should supplement rather than replace human communication partners. Communication involves cultural, emotional, contextual, relational, and embodied meanings that automated translation systems may fail to interpret accurately.

4.2 Adaptive and Personalised Learning

Personalisation is frequently identified as one of AI's most significant educational capabilities (Voultsiou & Moussiades, 2025). This capability may be particularly valuable for students with deafblindness because of the considerable heterogeneity within this population. An AI-supported learning environment could potentially develop an individual accessibility profile incorporating:
functional hearing and vision;
preferred communication modalities;
Braille proficiency;
tactile communication requirements;
processing time;
language proficiency;
cognitive accessibility;
assistive technologies;
previous performance; and
patterns of successful interaction.
Based on this information, instructional materials could be dynamically adapted according to the learner's needs. For example, an AI system might recognise that a student is repeatedly experiencing difficulty with an abstract concept and provide a simplified explanation, concrete example, tactile representation, additional repetition, or alternative learning sequence. Evidence from broader disability research suggests that adaptive and personalised AI systems can contribute positively to learning outcomes, although the empirical base remains uneven (Paglialunga & Melogno, 2025; Zhang et al., 2026). In deafblind education, therefore, AI recommendations should remain subject to professional judgement rather than becoming autonomous instructional decisions.

4.3 Multimodal Sensory Transformation

The concept of **multimodal sensory transformation** represents one of the most important potential contributions of AI to deafblind education. AI can theoretically transform information from inaccessible modalities into accessible ones:
Speech → Text → Braille
Image → AI Interpretation → Text Description → Braille
Environmental Sound → AI Recognition → Haptic Signal
Complex Text → AI Simplification → Accessible Braille/Text
Video → Scene Recognition → Structured Description → Accessible Output
Environmental Event → Sensor/AI Detection → Tactile Notification

The significance of this process lies not merely in conversion but in interpretation. Contemporary AI systems can increasingly identify the semantic content of images, language, and environmental information before transforming it. For example, instead of simply converting visual pixels, computer vision may identify objects, people, locations, actions, and relationships within an image. The resulting information could subsequently be converted into structured descriptions accessible through Braille or tactile technologies. This concept aligns with UDL principles concerning multiple representations and accessible technologies (CAST, 2024), but extends these principles towards a more dynamic sensory-conversion model specifically designed for combined sensory loss.

4.4 Intelligent Environmental Access

Environmental access is another area in which AI-enhanced technologies may contribute to independence and participation. Computer vision, wearable sensors, object recognition, environmental sound recognition, location technologies, and haptic interfaces could potentially detect information such as:
approaching individuals;
obstacles;
classroom changes;
objects and landmarks;
signage;
important environmental sounds;
changes in classroom activities; and
emergency events.
The system could then communicate this information through individually configured tactile signals, vibration patterns, Braille messages, or accessible text. The WHO and UNICEF (2022) emphasise that appropriate assistive technologies can contribute significantly to participation, education, independence, and quality of life. AI could potentially extend existing assistive technologies by making environmental information increasingly responsive and context-sensitive. Nevertheless, intelligent environmental technologies should never substitute for orientation and mobility training or established safety practices. Incorrect AI-generated environmental information could have significant consequences for individuals who cannot independently verify visual or auditory information.

4.5 Generative AI for Accessible Educational Materials

Generative AI introduces another potentially transformative application. Teachers may use generative systems to create or adapt instructional materials according to learners' accessibility requirements. Potential applications include:
simplifying complex passages;
generating alternative explanations;
producing descriptions of visual materials;
creating differentiated learning activities;
preparing accessible assessment questions;
generating structured summaries;
adapting vocabulary;
preparing Braille-ready textual materials; and
producing alternative examples according to individual learning levels.
These capabilities could reduce the time required for teachers to differentiate instructional resources. However, UNESCO (2023) cautions that generative AI in education must be implemented within a human-centred framework that protects human agency, privacy, inclusion, equity, and pedagogical integrity. AI-generated content may contain inaccurate information, fabricated claims, cultural biases, or inappropriate instructional material. For deafblind learners, these risks may be amplified because independent verification of AI-generated visual or auditory descriptions may be difficult. Consequently:
AI-generated accessibility information should always be considered assistive rather than authoritative.

4.6 AI-Assisted Assessment and Progress Monitoring

AI may also support more individualised approaches to assessment. Traditional assessment procedures can underestimate students with deafblindness when test instructions, response formats, or environmental conditions are inaccessible. AI-enhanced learning analytics could potentially provide additional evidence by examining patterns across repeated learning experiences. Relevant indicators might include:
response accuracy;
response latency;
number of prompts required;
communication mode;
task persistence;
frequency of assistance;
patterns of successful responses;
engagement; and
progression over time.
Such data could assist teachers in identifying changes that might not be apparent from conventional assessment alone. Nevertheless, AI-generated interpretations must be contextualised. A longer response time, for instance, may reflect tactile information processing or Braille reading rather than cognitive difficulty. Automated systems that ignore such contextual factors risk generating discriminatory interpretations.

5. The AI-Enhanced Multisensory Support Framework for Deafblind Education (AIMS-DB)

Based on the preceding analysis, this paper proposes the AI-Enhanced Multisensory Support Framework for Deafblind Education (AIMS-DB). AIMS-DB conceptualises AI not as an autonomous replacement for teachers but as an intelligent accessibility mediation layer connecting students with otherwise inaccessible information, learning activities, communication, and environments. The framework comprises six interconnected dimensions.

Dimension 1: AI-Supported Communication

AI facilitates communication through speech recognition, natural language processing, communication translation, accessible transcription, and integration with Braille, tactile, AAC, and haptic systems.

Dimension 2: Adaptive and Personalised Learning

AI dynamically adapts content, instructional sequencing, complexity, feedback, and representation according to individual sensory, communication, cognitive, and learning profiles.

Dimension 3: Multimodal Sensory Transformation

AI converts information between auditory, visual, textual, tactile, Braille, and haptic modalities, allowing information unavailable through one sensory channel to become accessible through another.

Dimension 4: Intelligent Environmental Access

AI-supported sensors, wearables, computer vision, and environmental recognition systems provide accessible information concerning physical and social environments.

Dimension 5: AI-Assisted Teacher Decision-Making

AI supports rather than replaces professional judgement by organising learner data, identifying patterns, suggesting instructional adaptations, and facilitating preparation of accessible educational materials.

Dimension 6: Ethical and Human-Centred Implementation

All five technological dimensions are governed by accessibility, privacy, transparency, safety, fairness, learner autonomy, dignity, human oversight, and equitable access. Conceptually, the framework can be represented as:

STUDENT WITH DEAFBLINDNESS

↓

Individual Sensory–Communication–Learning Profile

↓

AI ACCESSIBILITY MEDIATION LAYER

↓

AI-Supported Communication

↔

Adaptive and Personalised Learning

↔

Multimodal Sensory Transformation

↔

Intelligent Environmental Access

↔

Teacher Decision Support

↓

Accessible Educational Participation

↓

Communication | Learning | Independence | Social Participation | Agency | Self-Determination

Surrounding the entire system is:

Ethics + Human Agency + Accessibility + Human Relationships + Professional Oversight

The central proposition of AIMS-DB is therefore:

AI should transform access to information, not replace the human relationships through which information acquires educational and social meaning.

6. Human–AI Collaboration: The Role of Teachers and Interveners

The expansion of AI does not reduce the importance of teachers, interveners, and communication partners. Rather, it changes the technological and pedagogical competencies required of these professionals. Teachers working with students with deafblindness must be capable of determining whether AI-generated information is accurate, accessible, developmentally appropriate, culturally relevant, and consistent with an individual student's communication system. This requires an emerging combination of deafblind pedagogical competence and AI literacy. Teachers need to understand not only how to operate AI systems but also how to recognise algorithmic limitations, verify generated content, protect student data, adapt technological outputs, and determine when AI should or should not be used.

Interveners remain equally important. Deafblind communication is deeply relational. Human communication partners provide emotional security, shared attention, anticipation, contextual interpretation, trust, and reciprocal meaning-making that automated systems cannot replicate. Rice and Dunn (2023) caution against positioning AI primarily as a mechanism for reducing the perceived burden associated with educating students with disabilities. Instead, technologies should empower students and families and strengthen learner participation and agency. AIMS-DB therefore advocates human–AI collaboration rather than human replacement.

7. Ethical and Implementation Challenges

7.1 Algorithmic Bias and Underrepresentation

Algorithmic systems learn from data, and the quality and representativeness of those data significantly influence performance. People with deafblindness constitute a relatively small and heterogeneous population and are unlikely to be adequately represented within many mainstream AI datasets. Consequently, systems trained predominantly on hearing and sighted populations may perform poorly when interpreting deafblind communication, behaviour, or accessibility requirements. This represents both a technical and ethical problem. UNESCO (2021) emphasises that AI development should respect human rights, human dignity, fairness, diversity, inclusion, transparency, and human oversight. These principles are especially important when technologies affect people who have historically experienced exclusion from mainstream technological design.

7.2 Privacy and Data Protection

AI-enhanced education may involve extensive collection of data concerning disability, communication, behaviour, educational performance, location, sensory characteristics, and interaction patterns. Such information can be highly sensitive. Governance mechanisms should therefore determine:

what information is collected;

the educational justification for collecting it;

how consent is obtained;
where information is stored;
who can access it;
how long information is retained; and
how students and families can control their information.
UNESCO (2023) identifies privacy and data governance as central concerns in responsible educational AI.

7.3 Accuracy and Reliability

AI systems are probabilistic and therefore capable of producing incorrect interpretations. Speech-recognition systems may mistranscribe classroom discussions. Computer-vision applications may misidentify objects. Generative AI may fabricate information. Environmental recognition systems may overlook significant events. These limitations are particularly consequential for deafblind users because they may be unable to independently verify the original auditory or visual information. Human oversight must consequently be treated as a fundamental design requirement rather than an optional safeguard.

7.4 Digital Inequality

The promise of AI-enhanced accessibility is also constrained by inequalities in access to technology. The WHO and UNICEF (2022) estimated that billions of people require assistive products while access remains substantially unequal globally. Advanced AI-supported systems may further require compatible devices, connectivity, technical support, maintenance, specialised training, and financial resources. Without deliberate equity policies, AI could therefore produce a new accessibility divide: students who possess AI-enhanced assistive ecosystems versus students who lack even basic assistive technologies.

7.5 Teacher Preparedness

Teacher competence represents another critical implementation factor. AI literacy should consequently become part of professional preparation for special educators. Relevant competencies include:
understanding fundamental AI capabilities and limitations;
evaluating AI-generated information;
protecting learner privacy;
integrating AI with assistive technologies;
designing accessible prompts and instructional resources;
recognising algorithmic bias;
evaluating accessibility; and
maintaining appropriate human oversight.
This approach corresponds with UNESCO's (2023) recommendation that educational institutions build teacher capacity for responsible and pedagogically appropriate AI use.

7.6 Technological Dependency and Human Relationships

Perhaps the most significant philosophical concern involves excessive technological dependency. Communication for people with deafblindness cannot be reduced to information transmission. It also involves presence, reciprocity, trust, touch, shared experience, emotional connection, and social relationships. Technological systems that increase access while reducing human interaction could therefore paradoxically create a different form of exclusion. The objective should consequently be: more technology where technology increases human participation, and more human interaction where relationships provide what technology cannot.

8. Discussion

The literature reviewed in this paper indicates that AI has meaningful potential to enhance educational opportunities for students with disabilities. Systematic reviews increasingly identify applications involving adaptive learning, communication technologies, intelligent tutoring, robotics, and accessibility support (Panjwani-Charania & Zhai, 2024; Voultsiou & Moussiades, 2025). Meta-analytic evidence also suggests positive overall effects of AI-supported interventions for students with disabilities (Zhang et al., 2026). However, extrapolating these findings directly to deafblindness would be premature. The distinctive contribution of this paper is therefore to shift the conceptual emphasis from AI as an instructional technology towards AI as an accessibility mediator. For many mainstream learners, discussions of educational AI begin with personalisation:

How can AI personalise learning?

For students with deafblindness, a more fundamental question precedes this:

How can the learner access the information that is being personalised?

This distinction suggests a hierarchy:

Accessibility → Communication → Participation → Personalisation → Learning

Without accessibility, personalisation has limited meaning. The AIMS-DB framework therefore positions multimodal sensory transformation at the conceptual intersection between AI capabilities and deafblind educational needs. AI may be especially valuable when it transforms information across sensory channels rather than simply automating existing instructional practices. A second contribution concerns human agency. Recent

critiques caution that disability-related AI research can position technology as solving a perceived problem located within disabled individuals rather than addressing barriers embedded within educational systems (Rice & Dunn, 2023). AIMS-DB adopts the opposite position: the learner is not the problem to be corrected. Instead, AI is used to transform inaccessible environments and information. This position corresponds with UDL's contemporary emphasis on identifying and reducing systemic barriers while valuing diverse modes of communication and expression (CAST, 2024). Third, the framework emphasises human–AI complementarity. UNESCO's ethical and educational AI guidance consistently emphasises human agency and oversight (UNESCO, 2021, 2023). Within deafblind education, these principles become especially important because communication and learning are profoundly relational. Consequently, the most appropriate future model is unlikely to be:
AI → Student
but rather:
Student ↔ Human Communication Partner ↔ AI ↔ Accessible Environment
AI becomes part of an educational ecosystem rather than the centre of it.

9. Implications for Research

The limited deafblind-specific evidence base provides substantial opportunities for future research. First, empirical research should examine whether AI-supported cross-modal technologies genuinely improve educational access. Potential interventions include speech-to-Braille classroom systems, AI-generated descriptions of visual educational materials, tactile notification systems, and adaptive learning environments designed around individual sensory profiles. Second, usability research should directly involve students with deafblindness. Technologies developed without users' participation may technically function while remaining practically inaccessible. Participatory and co-design approaches should therefore involve:
students with deafblindness + teachers + interveners + families + technologists + researchers.
Third, future studies should examine outcomes beyond academic achievement. Relevant outcomes include communication autonomy, environmental awareness, social participation, self-determination, independence, engagement, and quality of educational experience. Fourth, longitudinal studies are required. Much AI research evaluates short-term technological performance, while relatively little is known about sustained educational use, dependency, abandonment, or long-term effects. Finally, future studies should empirically test the six dimensions and relationships proposed within AIMS-DB. The framework can therefore function as a conceptual foundation from which measurable constructs, implementation indicators, and intervention models are developed.

10. Implications for Educational Policy and Practice

AI strategies in education should explicitly address students with disabilities rather than assuming that mainstream technologies will automatically become inclusive.
Policies concerning AI-enhanced deafblind education should address:
accessibility standards;
assistive technology interoperability;
procurement requirements;
data governance;
privacy protection;
teacher competencies;
technical support;
funding;
participatory design; and
monitoring and evaluation.
Accessibility should be incorporated at the procurement and design stages rather than addressed retrospectively. Schools should also avoid implementing AI merely because a technology is innovative. Decisions should begin with an educational question:
What barrier experienced by this student is the technology intended to reduce?
Only after the barrier is identified should an AI solution be considered. This barrier-first approach prevents technology from becoming an objective in itself.

11. Future Directions

Future developments in generative AI, computer vision, natural language processing, wearable computing, haptic technologies, robotics, and intelligent assistive devices are likely to expand possibilities for deafblind accessibility. Future systems may potentially recognise classroom events in real time, identify relevant environmental information, translate communication between modalities, adapt learning materials according to individual accessibility profiles, and deliver information through personalised tactile interfaces. Nevertheless,

technological possibility should not automatically determine educational desirability. The development of AI for deafblind individuals should follow the principle:
Technology should adapt to human diversity rather than requiring human diversity to adapt to technology. People with deafblindness should therefore participate in AI research not merely as research subjects but as co-designers, evaluators, advisers, and decision-makers. The principle of **"nothing about us without us"** is particularly relevant to the next generation of intelligent assistive technologies.

12. Conclusion

Artificial intelligence creates important possibilities for addressing persistent communication, accessibility, instructional, and environmental barriers experienced by students with deafblindness. Emerging developments in natural language processing, speech recognition, computer vision, adaptive learning, generative AI, wearable technologies, and haptic interfaces make it increasingly possible to transform information between sensory modalities and personalise access according to individual learner characteristics. However, the literature demonstrates that AI research involving students with disabilities remains developing, while deafblind-specific evidence is particularly scarce. Consequently, technological optimism should be balanced by rigorous empirical research, participatory design, ethical safeguards, and professional oversight. This paper proposed the AI-Enhanced Multisensory Support Framework for Deafblind Education (AIMS-DB) comprising six interconnected dimensions: AI-supported communication, adaptive and personalised learning, multimodal sensory transformation, intelligent environmental access, AI-assisted teacher decision-making, and ethical and human-centred implementation. The central contribution of AIMS-DB is the conceptualisation of AI as an intelligent accessibility mediator rather than an autonomous replacement for teachers or communication partners. Within this perspective, AI occupies the space between inaccessible information and the learner, transforming information into forms that correspond with individual sensory and communication profiles. The ultimate measure of successful AI implementation should therefore not be technological sophistication. Success should be evaluated according to whether students with deafblindness experience improved communication, meaningful access to learning, greater independence, stronger agency, enhanced social participation, and increased self-determination. The future of AI-enhanced deafblind education should consequently be neither technology-centred nor disability-centred, but human-centred, accessibility-driven, and participation-oriented...

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