Artificial Intelligence and Disability Inclusivity

Opportunities, Risks and a Bhutan-Focused Pathway to Equitable Inclusion

Pema Chhogyel[1]

Abstract

Artificial intelligence (AI) is reshaping education, communication, employment and public services. For persons with disabilities, it offers important opportunities through speech recognition, captioning, screen-reader support, adaptive learning, augmentative and alternative communication, smart navigation and personalised services.

Yet AI can also deepen exclusion when systems are inaccessible, biased, unaffordable, English-dominant or designed without people with disabilities. This article examines AI through disability-rights, social-model, universal-design and ethical-governance perspectives, with particular attention to Bhutan. It argues that inclusion must be built into the full AI life cycle, from problem definition and data collection to procurement, testing, deployment and redress.

Bhutan's National Policy for Persons with Disabilities 2019, Artificial Intelligence Readiness Assessment 2024 and National AI Strategy 2025 provide a useful policy foundation. The article proposes a practical pathway centred on co-design, multilingual and multimodal access, accessibility testing, data protection, human oversight, inclusive procurement and AI literacy. Persons with disabilities should participate as compensated experts, testers and decision-makers rather than only as end-users.

Keywords: artificial intelligence, disability inclusion, Bhutan, assistive technology, universal design, accessibility, dzongkha, co-design, digital equity

1 Pema Chhogyel is Programme Analyst with the Inclusive Education, ECCD & SEN Division, School Education Dept., Ministry of Education and Skills Development, Royal Government of Bhutan.

Author's note on AI use:

As a person with total blindness, I have found artificial intelligence (AI) to be a valuable tool for improving access, independence, and professional participation using my Screen Readers: JAWS and NVDA. AI enables me to access and process diverse forms of information more efficiently, reducing many of the barriers commonly experienced in digital environments.

It strengthens my independence in using digital technologies, saves considerable time in completing academic and professional tasks, and improves my overall work efficiency. AI also enables me to keep pace with emerging digital developments and build confidence in using new technologies.

In my professional life, it supports clearer communication, more efficient preparation of documents and information, and greater productivity. From my experience, AI is not simply a technological convenience; it serves as an accessibility and empowerment tool that contributes to greater independence, competence, and professional participation for persons with visual disabilities.

Introduction

Artificial intelligence has moved rapidly into education, banking, recruitment, health information, communication and public administration. In education, AI supports personalised learning, automated feedback, translation and content generation. Research from South Asia and other settings shows strong interest in these possibilities, together with concerns about accuracy, privacy, equity, academic integrity and readiness (Ahn, 2024; Karki et al., 2023; Tamang et al., 2026; Walter, 2024).

For persons with disabilities, AI has particular significance. It can convert speech to text, describe images, simplify information, predict words for users of augmentative and alternative communication, support navigation and personalise learning.

However, the same systems may exclude users if they cannot be operated with a keyboard, captions are inaccurate, atypical speech is not recognised, or training data poorly represent disability.

The key issue is, therefore, not whether AI exists, but how it is designed, purchased, governed and evaluated. Disability inclusion must be embedded throughout the AI life cycle-problem definition, data collection, design, development, testing, deployment, monitoring and redress.

Rights-Based and Universal-Design Foundations

The social model of disability shifts attention from an individual impairment to the barriers created by environments and institutions. Applied to AI, this means changing the system rather than expecting the person to adapt. For example, an online government form should work with a screen reader and keyboard instead of requiring a user with blindness to obtain help from another person.

Universal Design and Universal Design for Learning strengthen this approach by promoting products, services and learning experiences that work for a wide range of users from the outset. In practice, an educational platform might provide text, audio, captions, adjustable font size, keyboard navigation and flexible pacing rather than offering only one mode of interaction.

The disability-rights principle "Nothing About Us Without Us" also requires meaningful participation. Bhutan's National Policy for Persons with Disabilities 2019 calls for consultation with persons with disabilities and their representative organisations (Gross National Happiness Commission, 2019).

For AI, participation should extend beyond consultation to co-design. People with disabilities should help define problems, test prototypes, identify risks and shape final decisions. Compensation is appropriate because this work uses lived experience and technical knowledge as professional expertise, not as voluntary feedback.

Opportunities for Inclusion

AI-supported speech-to-text, text-to-speech, real-time captioning, image description, optical character recognition and translation can improve access to information. A learner with blindness may use image description to understand a diagram; a learner who is deaf may follow a lecture through

accurate captions; and a learner with dyslexia may listen to written material. A person with a speech disability may also use predictive augmentative and alternative communication to express ideas more quickly.

Multimodal access matters because disability is diverse. Important public information should, therefore, be available in accessible text, audio, captioned video, plain language and screen-reader-compatible formats. In education, adaptive systems can adjust pace, difficulty and feedback. AI-powered e-learning has shown benefits when systems are well designed and users receive adequate support (Ahn, 2024).

Bhutanese studies also show growing use of generative AI among teachers and university students (Tamang et al., 2026; Wangdi & Rigdel, 2025). Teacher education should, therefore, incorporate inclusive AI literacy, covering how to select accessible tools, check output accuracy and protect learner information. For a learner who needs additional processing time, an AI tutor may repeat an explanation without pressure. For a learner with low vision, the same content could be converted into audio or enlarged text. These supports are useful only when teachers remain involved, and ensure that the technology matches the learner's actual needs.

AI may also support employment and independent living through transcription, scheduling, document preparation, remote collaboration, object recognition and smart-home functions. These tools can reduce routine barriers and allow some users to perform tasks with greater independence.

However, benefits must be balanced against automated recruitment systems that judge eye contact, voice, movement or communication style. Such criteria may disadvantage people with autism, speech differences or assistive-technology use. High-impact employment systems, therefore, need bias testing, accessibility testing and meaningful human review.

Risks and Ethical Challenges

The first risk is the digital and AI divide. AI is less useful where people lack reliable connectivity, affordable devices, electricity, digital skills or technical support. In Bhutan, mountainous geography and dispersed settlements can make access uneven. Offline-capable tools, community access points,

subsidised connectivity and device-loan schemes should, therefore, form part of an inclusion strategy. Without these measures, better-resourced schools and urban users may gain the benefits of AI faster while rural and lower-income users fall further behind.

A second risk is bias. AI systems learn from data that may under-represent people with disabilities, atypical speech, local sign languages or different forms of movement. This can reduce accuracy or reproduce stereotypes. Collecting more disability data is not automatically the answer, because such information is sensitive and could expose users to discrimination.

Good data governance requires accessible informed consent, collecting only information needed for a stated purpose, secure storage, clear retention periods and limits on secondary use. In simple terms, an agency should not collect a person's disability information merely because it might be useful later. Users should also have ways to inspect, correct or withdraw their data.

A third risk is over-automation. AI systems may process health information, learning profiles, voices, images, location and behaviour. Privacy, bias, misinformation and accountability are major ethical concerns in generative AI (Al-kfairy et al., 2024).

Automated systems should not become the sole decision-maker in high-impact areas such as disability benefits, education placement, health care or employment. Users need understandable explanations, a human appeal process and a non-digital alternative. For example, if an automated system incorrectly rejects an application for a public service, the applicant should be able to ask a responsible officer to review the decision rather than being directed back to the same system.

Bhutan's Policy Foundation and Inclusion Gaps

Bhutan has a useful starting point. The National Policy for Persons with Disabilities 2019 establishes commitments to participation and equal access. The Artificial Intelligence Readiness Assessment 2024 identifies progress in digital infrastructure and policy while also noting skills, funding and governance gaps (United Nations Development Programme [UNDP], 2025).

The Bhutan National AI Strategy 2025 gives attention to language technologies, including machine translation, large language models and speech systems, with potential benefits for digital access and Dzongkha services (GovTech Agency, 2025).

The main task is to translate these broad commitments into disability-specific implementation standards. Accessible Dzongkha AI should be accompanied by Bhutanese Sign Language, plain-language communication, screen-reader compatibility, alternative input methods and support for people with intellectual, psychosocial, sensory and multiple disabilities.

English-dominant AI creates additional exclusion for people who have both a disability and limited English proficiency. Essential public AI services should, therefore, provide Dzongkha text and speech, plain-language explanations, audio output, captions and human assistance. Language inclusion should also go beyond direct translation. Content should be tested with users from different regions and literacy levels. For lower-resource languages, Bhutan can begin with carefully curated terminology, community-recorded speech and domain-specific translation, rather than waiting for fully general-purpose models.

A Practical Inclusive-AI Pathway for Bhutan

Bhutan should develop a cross-government guideline on accessible and disability-inclusive AI, aligned with the National AI Strategy and the National Policy for Persons with Disabilities. It should apply to public agencies, schools, hospitals, local governments, state-owned enterprises and vendors that develop or procure AI-enabled systems.

Before approval or purchase, responsible agencies should require evidence that a proposed system meets these requirements. The evidence could include a co-design record, accessibility test results, privacy and fairness assessments, and a named process for human review and complaints.

First, persons with disabilities should be involved from the beginning of high-impact projects. Co-design groups should represent different disabilities, genders, ages, locations and language backgrounds. Participation itself must be accessible through sign-language interpretation, accessible documents, transport or remote options, and sufficient preparation

time. Compensation should cover the expertise and services provided by individual participants or disability organisations, particularly where they undertake structured testing, consultation or advisory work.

Second, accessibility testing should use real tasks, not only compliance checklists. An accessibility audit is a structured review of whether people with different access needs can use a system successfully. For example, a user with blindness should complete a full transaction with a screen reader, a user with deafness should understand audio information through captions or sign-language support, and a person with limited dexterity should navigate without precise gestures. A person with an intellectual disability should also be able to understand the purpose, choices and consequences of the service. Web and mobile systems should follow recognised accessibility standards, such as the Web Content Accessibility Guidelines.

Third, procurement should make accessibility enforceable. Public tenders should specify required outcomes, and suppliers should provide evidence that systems were tested with assistive technologies and users with disabilities. Contracts should require corrective action when updates create new barriers. This approach gives agencies a clear basis for approving, rejecting or requiring improvement to a system before public deployment.

Fourth, data and fairness safeguards should be mandatory. High-impact systems should document what disability-related data are collected, why they are needed, how long they are kept, and how users can challenge decisions. Performance should be tested across disability groups, languages, gender, age and location. Where errors are found, agencies should record corrective action and publish a suitable summary so that users understand the system's limits.

Finally, capacity building should combine AI literacy with disability awareness, universal design, critical evaluation and data ethics. Teachers and public officials need practical skills for choosing accessible tools, verifying AI outputs, protecting personal information and knowing when human support must take priority.

Educational institutions should also preserve reasonable accommodation, such as alternative formats, extra time, assistive technology or human support, when an AI tool does not meet a learner's needs. AI should

supplement, not replace, teachers, specialists, peer relationships or reasonable accommodation.

Conclusion

AI can make education, communication, employment and public services more accessible, but it can also automate existing exclusion. Bhutan has an opportunity to connect its emerging AI ecosystem with disability rights, linguistic inclusion and Gross National Happiness. Existing disability and AI policies provide a foundation, but practical standards are needed for design, language access, procurement, data protection, testing, human oversight and accountability.

The strongest approach is to recognise persons with disabilities as contributors to Bhutan's digital future. Their participation should be early, continuous, accessible, influential and compensated when they provide expertise or testing services. Inclusive AI is not only a technical issue. It is a commitment to dignity, equality, cultural identity and full participation.

References

Ahn, H. Y. (2024). AI-powered e-learning for lifelong learners: Impact on performance and knowledge application. *Sustainability, 16* (20), Article 9066. https://doi.org/10.3390/su16209066

Al-kfairy, M., Mustafa, D., Kshetri, N., Insiew, M., & Alfandi, O. (2024). Ethical challenges and solutions of generative AI: An interdisciplinary perspective. *Informatics, 11* (3), Article 58. https://doi.org/10.3390/informatics11030058

GovTech Agency (2025). Bhutan National AI Strategy 2025. Royal Government of Bhutan.

Gross National Happiness Commission (2019). National policy for persons with disabilities 2019. Royal Government of Bhutan.

Karki, D., Karki, N., Dahal, R. K., & Bhattarai, G. (2023). Future of education in the era of artificial intelligence. Journal of Interdisciplinary Studies, 12(1), 54–63. https://doi.org/10.3126/jis.v12i1.65448

Tamang, T. O., Daker, S., Gurung, B., & Dorji, U. (2026). Students' perspectives on integrating generative AI tools into teaching, learning, and assessment in higher education: A case of the Royal University of Bhutan. Journal of Research in Education and Pedagogy, 3(2), 130–154. https://doi.org/10.70232/jrep.v3i2.153

United Nations Development Programme (2025). Artificial intelligence readiness assessment (AIRA) 2024: Bhutan.

Walter, Y. (2024). Embracing the future of artificial intelligence in the classroom: The relevance of AI literacy, prompt engineering, and critical thinking in modern education. International Journal of Educational Technology in Higher Education, 21, Article 15. https://doi.org/10.1186/s41239-024-00448-3

Wangdi, T., & Rigdel, K. S. (2025). ChatGPT and education: Bhutanese teachers' knowledge, perceptions, and practices. Pertanika Journal of Social Sciences & Humanities, 33(2). https://doi.org/10.47836/pjssh.33.2.13

Declaration on AI-assisted editing. AI tools were used for language refinement, structure, and reference-format consistency. The author reviewed the content and remains responsible for the arguments, source use, and final text.