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Review Article

ARTIFICIAL INTELLIGENCE AND INDIAN KNOWLEDGE SYSTEMS IN EDUCATION: OPPORTUNITIES, CHALLENGES AND A CONCEPTUAL PERSPECTIVE

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ABSTRACT

Artificial Intelligence (AI) is increasingly influencing education. On the other hand, National Education Policy, 2020 has strengthened the relevance of Indian Knowledge Systems (IKS) in contemporary education. This theoretical paper adopts a conceptual and literature-based approach to examine the potential interface between AI and IKS. It focuses on educational opportunities and associated pedagogical, cultural and ethical concerns. The reviewed literature indicates that AI may support the documentation, accessibility, multilingual engagement and educational use of IKS. It also raises concerns regarding accuracy, cultural representation, linguistic diversity, data sovereignty, digital inequality and teacher preparedness. Based on the literature synthesis, a conceptual framework is proposed in which IKS serves as the knowledge base, AI functions as an enabling technology, and teachers and experts provide contextual and pedagogical mediation within ethical and cultural safeguards. The paper emphasizes that AI should complement, rather than replace, human expertise in engaging with IKS. It also calls for further empirical research across India's diverse educational and cultural contexts.

Keywords: Artificial Intelligence, Indian Knowledge Systems, AI in Education, Educational Technology, Indigenous Knowledge, Digital Learning, Teacher Education, Cultural Responsiveness

INTRODUCTION

Artificial Intelligence (AI) is becoming increasingly relevant to education. It is used in teaching, learning, assessment, content development and academic support. A systematic review by Wang et al. (2024) shows the wide range of applications and research perspectives within AI in education. Similarly, Yusuf et al. (2024), in a systematic mapping review of 407 publications on generative AI in education and research, identified growing studies on its applications, impacts, ethical concerns and educational use, while noting limited attention to its cultural dimensions. These developments suggest that the educational use of AI needs to be considered along with the social and cultural contexts in which learning takes place. This is particularly important in culturally and linguistically diverse settings. UNESCO's guidance for generative AI in education and research emphasizes a human-centred approach that considers equity, cultural and linguistic diversity, data protection, ethical use and human agency Miao and Holmes (2023). Likewise, the AI Competency Framework for Teachers highlights human-centred thinking, AI ethics, AI applications, AI pedagogy and professional learning as important areas of teacher competency Miao and Cukurova (2024). These perspectives show the importance of teacher judgement and contextual understanding when AI is introduced into educational practice.

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In India, this discussion is closely linked with renewed attention to Indian Knowledge Systems (IKS). The National Education Policy (NEP) 2020 encourages the inclusion of relevant aspects of Indian knowledge which includes tribal knowledge and indigenous/traditional ways of learning in an accurate and scientific manner Ministry of Human Resource Development (2020). The Indian Knowledge Systems Division has also undertaken activities related to research, documentation, faculty development and dissemination of IKS through educational and research initiatives Indian Knowledge Systems Division (n.d.). The intersection of AI and IKS is therefore an emerging area of educational discussion. AI may assist in organizing and retrieving knowledge resources, translation, documentation and the development of learning materials. At the same time, such possibilities should not be assumed that AI can independently preserve, authenticate or represent IKS. Knowledge rooted in particular languages and cultural contexts often requires careful interpretation and verification. Concerns regarding the cultural dimensions and ethical use of generative AI reinforce this need Yusuf et al. (2024).

INDIAN KNOWLEDGE SYSTEMS AND ITS RELEVANCE TO CONTEMPORARY EDUCATION

Indian Knowledge Systems (IKS) cover diverse cultural and pedagogical traditions that have developed across different periods, regions and communities. It includes areas such as philosophy, mathematics, astronomy, medicine, linguistics, agriculture, arts and education. Rather than representing a single or uniform body of knowledge, IKS reflects a diverse knowledge landscape whose different forms need to be understood within their historical and cultural contexts Kumari and Niyogi (2025).The National Education Policy (NEP) 2020 provides an important policy basis for incorporating IKS into contemporary education. It recommends tribal knowledge and indigenous/traditional ways of learning in an accurate and scientific manner Ministry of Human Resource Development (2020). The University Grants Commission (2023) has also issued guidelines for faculty orientation and training in IKS. This reflects growing institutional attention to its educational integration. The integration of IKS into formal education, however, requires appropriate curriculum design, teacher preparation, contextual understanding and accurate representation. Singh (2025) discusses curriculum integration, interdisciplinary approaches, technological resources and educator capacity-building. They also noted challenges such as curricular rigidity, linguistic barriers and limited empirical evidence. Kumar (2024) similarly discusses the need to connect Indian knowledge traditions meaningfully with contemporary higher education. The regional, linguistic and community-based diversity of IKS calls for inclusive documentation and representation Kumari and Niyogi (2025). Its integration should therefore involve contextualization and critical examination rather than treating traditional knowledge as a uniform or unquestioned body of knowledge. In this context, IKS can serve as a culturally situated resource for contemporary education. It can also provide a basis for considering how AI might support its documentation, accessibility and educational engagement.

ARTIFICIAL INTELLIGENCE

Artificial Intelligence (AI) has become increasingly important to education. It has its applications in personalized learning, assessment, feedback, learning analytics, content development and academic support Wang et al. (2024). The growth of generative AI has expanded these possibilities through interactive dialogue and the generation of learning materials. Yusuf et al. (2024), in a systematic mapping review, found growing research on the applications, benefits, limitations and ethical implications of generative AI in education. However, AI-generated content can be inaccurate or misleading which raises concerns about privacy, bias, academic integrity, transparency and equity Miao and Holmes (2023), Yusuf et al. (2024). A meta-systematic review of AI research in higher education similarly calls for greater attention to ethics, collaboration and methodological rigour in the development and use of AI in education Bond et al. (2024). AI should therefore complement rather than replace teachers or serve as an independent educational authority. UNESCO's AI Competency Framework for Teachers highlights human-centred thinking, ethics, AI pedagogy and professional learning as important areas of teacher competency Miao and Cukurova (2024). A critical review of AI competency frameworks similarly highlights the growing need to clarify the competencies required in educational settings by educators to engage meaningfully with AI Mikeladze et al. (2024). In culturally and linguistically diverse contexts like India, the usefulness of AI also depends on its accuracy, cultural sensitivity and appropriate integration with curriculum, pedagogy and human judgement.

A meaningful engagement between AI and IKS therefore requires technology to be used with human judgement. Teachers, learners, scholars and subject experts have an important role in selecting, interpreting, contextualizing and verifying AI-supported knowledge. This is consistent with the human-centred approach advocated by UNESCO Miao and Holmes (2023), Miao and Cukurova (2024). Since research specifically examining AI–IKS integration in education remains limited, claims about its educational effectiveness need to be made cautiously. Therefore, the theoretical paper explores the potential of AI in engaging with IKS. It also discusses the pedagogical, cultural and ethical considerations that need to guide such integration.

OBJECTIVES

The paper aims to examine the interface between Artificial Intelligence (AI) and Indian Knowledge Systems (IKS) in the context of education. Specifically, it seeks to:

1) examine the relevance of Indian Knowledge Systems in contemporary education;

2) explore the potential of Artificial Intelligence in supporting the preservation, accessibility and educational integration of Indian Knowledge Systems;
3) discuss the opportunities and challenges associated with integrating Artificial Intelligence with Indian Knowledge Systems in education; and
4) propose a conceptual perspective for the meaningful and responsible integration of Artificial Intelligence and Indian Knowledge Systems in educational practice.

METHODOLOGY

The paper adopts a conceptual and literature-based approach. Relevant scholarly literature, policy documents and institutional publications on Artificial Intelligence (AI) in education, Indian Knowledge Systems (IKS), educational technology and the ethical use of AI were identified, reviewed and thematically synthesized. The review focused on four areas: (i) the relevance of IKS to contemporary education, (ii) applications of AI in education, (iii) the potential interface between AI and IKS, and (iv) related pedagogical, cultural and ethical considerations. Key policy documents, particularly the National Education Policy (NEP) 2020, were also considered. The synthesis informed the discussion of opportunities and challenges and the proposed conceptual framework for responsible AI–IKS integration in education.

INTERFACE BETWEEN ARTIFICIAL INTELLIGENCE AND INDIAN KNOWLEDGE SYSTEMS

The relationship between Artificial Intelligence (AI) and Indian Knowledge Systems (IKS) is an emerging area of educational inquiry. AI may support the documentation, organization, retrieval, translation and educational use of IKS. A recent systematic review identifies digitization, preservation, dissemination, multilingual learning and culturally responsive pedagogy as potential areas of AI–IKS integration Saikia (2026). However, these remain emerging possibilities rather than established educational outcomes. AI can assist in organizing and preserving textual, audio and visual knowledge resources, but digital preservation alone cannot ensure that their cultural context and meaning are retained. Research on AI and Indigenous peoples also highlights concerns related to cultural knowledge erosion, data practices and knowledge sovereignty Perera et al. (2025). Similarly, AI-based language technologies may improve access across linguistic contexts, but their development and use also raise concerns about linguistic representation, community participation and data sovereignty Kwok (2026). AI may assist teachers in developing supplementary materials and interdisciplinary activities related to IKS, although such content requires careful verification and contextualization Saikia (2026). Thus, AI can serve as a useful technological support for engaging with IKS, but it should not be regarded as an authority on culturally situated knowledge. Human oversight remains essential for interpretation, contextualization and verification Miao and Holmes (2023), Miao and Cukurova (2024). Meaningful AI–IKS integration therefore depends not only on technological capability. It also depends on accuracy, cultural and linguistic sensitivity, responsible data practices and human judgement.

OPPORTUNITIES OF INTEGRATING ARTIFICIAL INTELLIGENCE WITH INDIAN KNOWLEDGE SYSTEMS IN EDUCATION

The integration of Artificial Intelligence (AI) with Indian Knowledge Systems (IKS) offers several possibilities for education. However, since direct empirical research in this area remains limited, these should be viewed as emerging possibilities rather than established educational outcomes Perera et al. (2025), Saikia (2026).

1) **Digital Preservation and Documentation:** AI may assist in digitizing, organizing, transcribing and retrieving IKS resources, including textual, oral, audio and visual materials. Such applications may be particularly useful for dispersed or community-based knowledge Perera et al. (2025), Saikia (2026).
2) **Multilingual Access:** AI-supported translation, speech recognition and language technologies may improve access to IKS resources across India's linguistic diversity. However, human verification remains necessary because automated systems may not adequately capture culturally specific meanings Kwok (2026), Saikia (2026).
3) **Development of Learning Resources:** AI may assist teachers in preparing supplementary materials, discussion questions and interdisciplinary activities that connect IKS with areas such as agriculture, ecology, mathematics, medicine, architecture and linguistics.
4) **Culturally Contextualized Learning:** In principle, AI may also assist in developing learning materials using appropriately documented local and regional knowledge. This could potentially make classroom learning more connected to learners' cultural contexts. Such contextualization, however, should involve teachers and knowledgeable community members and not rely solely on AI-generated content.
5) **Interactive Learning:** Conversational AI may allow learners to explore selected IKS resources through questions, explanations and dialogue. Such interactions should support inquiry and not be treated as authoritative sources as there is possibility of inaccurate or fabricated responses Miao and Holmes (2023), Yusuf et al. (2024).

6) **Support for Teachers and Researchers:** AI may also help teachers and researchers organise literature, locate related resources, prepare preliminary summaries and explore connections across disciplines. Its role should remain supportive, with source evaluation, interpretation and scholarly judgement retained by humans Miao and Cukurova (2024).

CHALLENGES AND ETHICAL CONSIDERATIONS

The integration of Artificial Intelligence (AI) with Indian Knowledge Systems (IKS) raises important cultural and ethical concerns. Since IKS includes diverse and community-based knowledge traditions (in some cases), making such knowledge digitally accessible does not necessarily ensure its accurate or appropriate representation. Research on AI and Indigenous knowledge highlights concerns related to cultural knowledge erosion, inappropriate data practices, knowledge hierarchies and knowledge sovereignty Perera et al. (2025). Accuracy and cultural representation are central concerns. AI systems may produce plausible but inaccurate information. Culturally situated knowledge may also be simplified, decontextualized or interpreted incorrectly. AI-generated representations of IKS should therefore be examined against credible scholarly, primary and, community sources (where appropriate), and not be treated as authoritative.

Language and digital representation also require attention. Many culturally significant knowledge traditions are expressed through languages that may have limited representation in digital datasets. Research on AI and Indigenous languages highlights concerns regarding linguistic representation, data sovereignty and the potential consequences of developing language technologies without adequate community participation Kwok (2026). Within the emerging AI–IKS literature, limited representation of Indian languages has also been identified as a challenge Saikia (2026). Data ownership and knowledge sovereignty raise questions about who has the authority to collect, store, reproduce and use community-related knowledge. The digitization and AI processing of such knowledge require responsible data practices and respect for community participation and decision-making Perera et al. (2025), Kwok (2026).

Digital inequality and teacher readiness may also affect meaningful integration. Saikia (2026) identifies the digital divide and teacher readiness among the challenges in the emerging AI–IKS literature. Access to AI technologies alone cannot ensure equitable or meaningful participation. Teachers require both appropriate AI competencies and sufficient understanding of the knowledge they seek to incorporate. Human oversight and ethical governance are essential. AI should function as a supporting technology rather than as an independent authority on IKS. Teachers, researchers, subject experts and, stakeholders need to remain involved in interpreting, contextualizing and verifying AI-supported representations of IKS. Thus, responsible AI–IKS integration requires attention to accuracy, cultural representation, linguistic inclusion, responsible data practices, equity and human judgement.

A PROPOSED CONCEPTUAL FRAMEWORK FOR AI–IKS INTEGRATION IN EDUCATION

The relationship between Artificial Intelligence (AI) and Indian Knowledge Systems (IKS) involves technology, knowledge, pedagogy, culture and human judgement. Emerging literature points to possibilities such as digital preservation, multilingual learning and culturally responsive pedagogy. It also draws attention to language representation, teacher readiness, bias and digital inequality Saikia (2026), as well as cultural representation and knowledge sovereignty Perera et al. (2025), Kwok (2026). Based on these considerations, a conceptual framework is proposed with four interconnected components: IKS Knowledge Resources, AI-Enabled Processes, Teacher/Expert Mediation and Educational Engagement, all of which are supported throughout by Ethical, Cultural and Academic Safeguards.

1) IKS KNOWLEDGE RESOURCES

This component represents the knowledge base. It includes documented texts, oral traditions, languages, community knowledge, practices and knowledge from different disciplines. Their selection and documentation require appropriate contextual and scholarly verification. AI-generated information should not be treated as the original authority on IKS.

2) AI-ENABLED PROCESSES

AI may support the digitization, classification, retrieval, transcription, translation, content development and interactive exploration of IKS resources Saikia (2026). Its usefulness, however, depends on the quality of available data, language representation and human oversight.

3) TEACHER/EXPERT MEDIATION

Teachers, researchers, subject experts and knowledge holders (where appropriate) play a central role in selecting, interpreting, contextualizing and verifying AI-supported IKS content. Learners should likewise be encouraged to evaluate AI-generated information critically. This reflects UNESCO's emphasis on human-centred thinking, ethics and AI pedagogy in teacher competency Miao and Cukurova (2024).

4) EDUCATIONAL ENGAGEMENT

This component represents the use of AI-supported IKS in learning through resources, classroom activities, interdisciplinary exploration, multilingual learning, discussion and inquiry. Such engagement should remain aligned with curricular objectives and guided by teachers.

5) ETHICAL, CULTURAL AND ACADEMIC SAFEGUARDS

These safeguards operate across the entire framework and include accuracy, cultural representation, linguistic inclusion, responsible data practices, knowledge sovereignty, inclusiveness and human agency. They are important because AI may reproduce bias, generate inaccurate information or present culturally situated knowledge without adequate context Kwok (2026), Perera et al. (2025). A human-centred approach to AI emphasizes ethical use and human agency Miao and Holmes (2023).

The proposed relationship can be represented as:

Figure 1

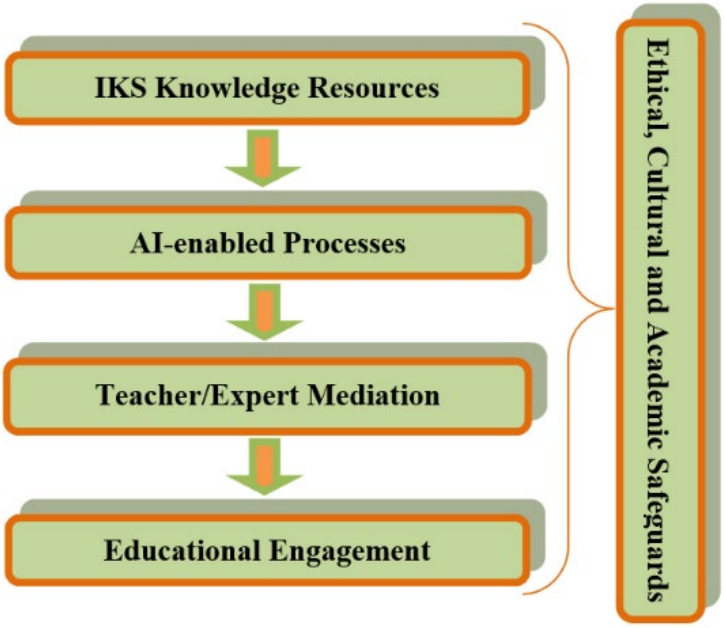

Figure 1 Proposed Conceptual Framework for the Integration of Artificial Intelligence and Indian Knowledge Systems in Education

The framework positions AI as a supportive and enabling technology rather than an independent authority or replacement for teachers, scholars or knowledge holders. Its potential educational value depends on the quality and contextual validity of IKS resources, appropriate use of AI, teacher competence, expert involvement and responsible governance. The framework is therefore proposed not as a tested or validated educational model, but as a conceptual basis for discussion and further empirical investigation.

IMPLICATIONS FOR EDUCATIONAL PRACTICE

The integration of Artificial Intelligence (AI) with Indian Knowledge Systems (IKS) has emerging implications for curriculum, pedagogy, teacher education and digital learning resources Saikia (2026). AI may help teachers develop contextualized and interdisciplinary materials. It also supports the documentation, organization, retrieval and multilingual accessibility of IKS resources. However, such applications require human verification because AI-generated content may be inaccurate or culturally inappropriate Perera et al. (2025), Kwok (2026). Teacher preparation is particularly important. Teachers need not only the ability to use AI tools but also the capacity to evaluate AI-generated information, recognize potential bias and understand the cultural context of IKS. A systematic review by Aljemely (2024) highlights the importance of appropriate teacher training. They also discuss the challenges involved in preparing educators to use AI effectively in teaching. UNESCO emphasizes human-centred thinking, AI ethics and AI pedagogy as important areas of teacher competency Miao and Cukurova (2024). At the institutional level, meaningful AI–IKS integration requires appropriate digital infrastructure, teacher preparation, reliable knowledge resources, linguistic inclusion and ethical safeguards. AI should therefore serve as a supportive technology, at the same time, teachers, scholars and knowledge holders retain responsibility for interpretation, verification and contextualization.

LIMITATIONS

The paper is conceptual and literature-based. It does not include primary empirical data or testing of the proposed framework. Research specifically examining AI–IKS integration in education is still emerging. This limits evidence-based conclusions regarding its effectiveness. Also, the diversity of India's languages, regions and knowledge traditions cannot be comprehensively represented within a single theoretical paper. More empirical research across different educational and cultural contexts is therefore needed.

CONCLUSION

The integration of Artificial Intelligence (AI) with Indian Knowledge Systems (IKS) presents emerging possibilities for the preservation, accessibility, multilingual engagement and educational use of diverse Indian knowledge traditions. However, the evidence base remains developing. Likewise, AI should not be treated as an independent authority on IKS. Its meaningful use requires human judgement, cultural sensitivity, accurate representation, linguistic inclusion and ethical safeguards. Teachers, scholars and knowledge holders therefore remain central to interpreting and validating AI-supported IKS resources. Future empirical research across diverse Indian educational and cultural contexts is needed to understand how these possibilities can be responsibly translated into educational practice.

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