

Revitalizing the Indian Knowledge System: Integrating Technology for Preservation and Global Relevance

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Abstract

Ancient sciences, philosophy, arts and cultural heritage are all included in the Indian Knowledge System (IKS), a repository of knowledge accumulated over many centuries. It exhibits a holistic outlook on life, emphasising spiritual development, connectivity and sustainability. However, this treasure trove of information is at the risk of being marginalised due to the rapid industrialisation and homogenisation of world cultures. Technology integration offers a revolutionary way and opportunity to preserve, revive and spread IKS for future generations.

Through this paper, we will attempt to examine how technologies such as block-chain, virtual reality, artificial intelligence and digitisation can help preserve India's intangible cultural heritage. It appears that global access to the vast knowledge repository can be achieved through digitisation of manuscripts, texts and traditional practices. Ancient texts can be made more relevant to modern audiences by using artificial intelligence to improve language translation, contextual interpretation and pattern recognition. By recreating historical events, rituals, and architectural wonders, immersive technology such as virtual and augmented reality can provide engaging educational opportunities.

Additionally, block-chain protects against illegal exploitation by guaranteeing the legitimacy and ownership of cultural objects. By bringing IKS in line with contemporary educational frameworks and scientific discoveries, technological integration not only preserves it but also gives it new life. Traditional knowledge in fields such as yoga, Ayurveda, architecture, and sustainable agriculture can help address today's global issues. To develop a coherent plan for safeguarding IKS, this article is an attempt to highlight the need for interdisciplinary collaboration between technologists, academics, and politicians. India can guarantee that its rich intellectual heritage remains as a vibrant culture, inspires future generations, and provides guidance on living sustainable and peaceful lives using technology. Apart from preserving the core of Indian culture, this blend of traditional knowledge with modern technology will enhance its universal relevance in a rapidly changing world.

Keywords: Indian Knowledge System (IKS), Cultural Heritage, Technology Integration, Block-chain, Virtual Reality (VR), Artificial Intelligence (AI), Digitisation, Sustainability, Interdisciplinary Collaboration, Intangible Heritage Preservation.

Introduction

Thousands of years of collected learning are included in the Indian Knowledge System (IKS), a lasting reservoir of ancient sciences, philosophy, arts, and cultural legacy. It is distinguished by a holistic outlook that prioritizes connection, spiritual growth, and sustainable living. The unrelenting speed of globalization and industrialization has made IKS susceptible to marginalization despite its immense worth. Modern technology now provides a ground-breaking way to incorporate IKS into current educational frameworks and conserve and revitalize it, guaranteeing its relevance for next generations.

This article explores the applicability of IKS in the current educational system, highlighting the ways in which traditional knowledge and contemporary technology might work together to enhance education, advance sustainability, and stimulate intellectual curiosity around the world.

I The Relevance of the Indian Knowledge System in Education

India's intellectual heritage, which dates back thousands of years, is rooted in the Indian Knowledge System (IKS), which covers subjects as diverse as philosophy, science, mathematics, medicine, architecture, and the arts. From the establishment of early learning centres such as Takshashila (5th century BCE) and Nalanda (5th century CE) to the composition of ancient texts such as the Vedas, Upanishads, and Arthashastra, India has been a global beacon of holistic education.

After Independence, the relevance of IKS began to attract attention. Institutions such as the Indian Council of Historical Research (ICHR) and the Indira Gandhi National Centre for the Arts (IGNCA) led efforts to document and promote IKS. The National Education Policy (NEP) 2020 further recognised the potential of IKS, advocating its integration into the modern curriculum.

The Pedagogical Value of IKS

Education fosters character development, resilience building, and holistic growth in addition to being a tool for knowledge acquisition. By providing an interdisciplinary approach that combines the sciences, humanities, ethics, and spirituality, IKS exemplifies these values. IKS can fill in the gaps created by traditional teaching approaches, which frequently place more emphasis on memorization than on sustainability and critical thinking.

For instance, ancient writings like the Arthashastra and Panchatantra are ageless resources on strategy, ethics, and governance, while practices like yoga and Ayurveda offer insights into both physical and mental wellness. Education may develop well-rounded, creative thinkers by fusing old and modern knowledge systems.

Ethical Education and Sustainability

Sustainability is one of IKS's fundamental principles; this value aligns with the worldwide demand for ecological responsibility. Traditional resource management, architecture, and farming methods give students useful, environmentally responsible answers to today's issues. Integrating IKS ideas into curricula, like Vasudhaiva Kutumbakam (the world is one family), helps foster ideals of empathy, environmental stewardship, and world peace. IKS has always emphasised on living in harmony with nature. Concepts such as ahimsa (non-violence) and dharma (religious duty) underpin ecological and social responsibility.

Traditional resource management: Practices such as rainwater harvesting, organic farming and sustainable architecture (e.g., stepwells and mud houses) offer practical solutions to modern environmental challenges.

Philosophical underpinnings: The idea of vasudhaiva kutumbakam (the world is one family) promotes global unity and peace, which resonates with the United Nations Sustainable Development Goals (SDGs).

II Technology as a Catalyst for Integrating IKS into Education

In order to close the gap between IKS and modern educational systems, modern technologies can be quite helpful. IKS is guaranteed to be both preserved and modified to meet the demands of a worldwide society through the integration of technologies such as blockchain, artificial intelligence (AI), virtual reality (VR), and digitization. It is observed that Technology serves as a powerful bridge to integrate Indian Knowledge Systems (IKS) into modern education. Digitization enables the preservation of ancient manuscripts and texts,

ensuring their accessibility to a global audience while also protecting them from erosion. Artificial Intelligence (AI) plays a transformative role by translating and contextualizing these texts, making them relevant to contemporary learners. Virtual Reality (VR) and Augmented Reality (AR) provide immersive educational experiences, recreating ancient learning environments, rituals, and architectural wonders to foster a deeper understanding of IKS principles. Blockchain technology ensures authenticity and ethical use of IKS resources by maintaining a transparent record of ownership and intellectual property. Together, these technologies not only preserve the IKS but also adapt its teachings to meet the needs of a globalized and rapidly evolving society, ensuring that its knowledge continues to inspire future generations.

1. Digitization: Making IKS Accessible

Digitisation serves as a transformational tool in preserving and promoting the Indian Knowledge System (IKS), making it accessible to a global audience. Ancient manuscripts, inscriptions and texts written in languages such as Sanskrit, Pali and regional dialects hold vast repositories of knowledge spanning diverse fields such as philosophy, medicine, astronomy and ethics. However, many of these invaluable records are vulnerable to physical decay and limited by geographical and linguistic barriers. Digitisation addresses these challenges by creating digital archives that preserve these treasures for posterity while also ensuring their wide access.

Initiatives such as the National Digital Library of India (NDLI) and the Bharatavani project have made significant progress in digitising ancient texts, ensuring their availability to students, researchers and educators across the world. By scanning and uploading manuscripts, inscriptions and traditional knowledge resources to online platforms, digitisation eliminates the need for physical proximity, allowing anyone with internet access to explore IKS from anywhere in the world. This opens up new opportunities for interdisciplinary research and cross-cultural understanding.

Furthermore, advanced digitisation tools enable metadata tagging and classification of documents, making it easier to search and retrieve specific topics or themes. Digital archives also facilitate collaboration among scholars by providing a shared repository of information. For example, rare Ayurvedic texts or Vedic hymns can now be studied collectively by experts across the world, enhancing the interpretation and application of this knowledge. Digitisation

lays the groundwork for integrating Artificial Intelligence (AI) tools. AI-powered systems can analyse digitised texts to provide translations, identify patterns, and provide insights into historical, scientific and cultural contexts. This makes knowledge not only accessible but also relevant to modern audiences.

Moreover, digitisation ensures that future generations can access IKS resources forever, preserving the essence of Indian heritage while adapting it to the needs of a rapidly changing world. In short, digitization is not just a preservation technology but a dynamic enabler that democratizes access to the deep knowledge contained in IKS, ensuring its integration into modern educational systems and its continued relevance in addressing global challenges. Digitization not only ensures the preservation and accessibility of IKS but also unlocks its transformative potential in education and global scholarship. By safeguarding fragile manuscripts, creating platforms for worldwide access, and introducing innovative methods of interactive learning, digitization reshapes how IKS is experienced and understood in the modern era.

Digitisation offers an unprecedented opportunity to create a vast repository of IKS resources. Ancient manuscripts, oral traditions and indigenous practices can be digitised, catalogued and made accessible through online platforms.

- **Preservation:** To prevent physical deterioration, fragile manuscripts can be transformed into high-resolution digital versions.
- **Global Accessibility:** Students and academics around the world can examine IKS resources thanks to platforms like Google Arts & Culture and India's National Digital Library.
- **Interactive Learning:** Multimedia tools and digital texts can be combined to create dynamic, interesting modules for students.

2. Artificial Intelligence: Unlocking Ancient Knowledge

Artificial Intelligence (AI) is revolutionising the way we access and understand Indian Knowledge Systems (IKS). Ancient manuscripts written in complex scripts such as Sanskrit and Prakrit often pose challenges due to linguistic nuances and physical degradation. AI-powered tools including Optical Character Recognition (OCR) and Natural Language Processing (NLP) enable the digitisation and interpretation of these texts, converting them into searchable, understandable formats. These technologies not only decipher difficult-to-

read manuscripts but also provide accurate translations while preserving the original context and cultural essence of texts such as the Vedas, Upanishads and Arthashastra.

Furthermore, AI enhances the relevance of IKS by uncovering interdisciplinary connections within its vast repository. Advanced algorithms identify patterns and insights, linking ancient knowledge to modern scientific research in fields such as Ayurveda, mathematics and astronomy. For example, AI can analyze Ayurvedic texts to map traditional remedies against contemporary medicinal data, thereby promoting innovative healthcare solutions. Similarly, it facilitates knowledge mapping across different disciplines, allowing global scholars to collaborate on understanding and applying IKS principles to address today's challenges in sustainable development, ethics, and education. Through AI, the vast treasure of IKS becomes accessible, adaptable, and impactful for future generations. There are various ways that artificial intelligence can improve IKS's comprehension and accessibility:

- **Language Translation:** To make old literature in Sanskrit, Pali, or Prakrit understandable to a wide range of readers, AI-powered systems can translate them into contemporary languages.
- **Pattern Recognition:** For contemporary uses, machine learning algorithms can examine patterns in old scientific writings, such as astronomical computations or drug formulas.
- **Customized Learning:** To ensure greater acceptability and engagement, AI-based educational platforms can adapt IKS content to various age groups, learning levels, and cultural contexts.

3. Virtual and Augmented Reality: Experiential Learning

Virtual Reality (VR) and Augmented Reality (AR) are redefining the way Indian Knowledge Systems (IKS) are taught and experienced, transforming traditional education into an immersive journey through history, culture, and wisdom. These technologies enable learners to interact with IKS concepts in ways that were previously unimaginable, providing a multi-faceted approach to education. VR recreates historical settings, rituals, and ancient institutions, allowing students to virtually step into the halls of Nalanda University, participate in Vedic rituals, or observe traditional farming practices in action. Such experiences not only make learning engaging but also provide a deeper contextual understanding of the cultural and intellectual achievements of ancient India.

AR complements VR by overlaying digital information on the real world, allowing learners to explore IKS principles in their everyday environments. For example, AR applications can present 3D models of ancient architectural marvels such as the Brihadeeswarar Temple, providing detailed insights into their construction techniques and iconographic elements. Similarly, AR-based tools can provide step-by-step guidance on Ayurvedic practices or Vedic mathematics, transforming theoretical knowledge into practical applications. These technologies bridge the gap between abstract concepts and tangible experiences, making IKS accessible to learners of all ages and backgrounds.

By integrating VR and AR into educational frameworks, students not only learn but also develop personal connections to the rich heritage of IKS. This experiential learning approach enhances engagement, fosters curiosity, and ensures that the timeless wisdom of IKS is preserved and appreciated in a way that resonates with modern audiences. Further, IKS may be brought to life using immersive technologies like VR and AR, giving students a hands-on grasp of India's rich intellectual legacy.

- **Recreating Historical Contexts:** Students can virtually experience learning environments from centuries ago thanks to VR's ability to reproduce historic universities like Takshashila and Nalanda.
- **Interactive Storytelling:** AR can improve field excursions and site visits by superimposing historical narratives and cultural insights onto real-world sites.
- **Learning through Simulation:** In a virtual setting, students can participate in customary activities like Vedic ceremonies or antiquated engineering methods.

4. Blockchain: Ensuring Authenticity

Blockchain technology plays a vital role in safeguarding the authenticity and integrity of Indian Knowledge Systems (IKS). By creating a decentralised and tamper-proof ledger, blockchain ensures that digital manuscripts, artefacts and cultural assets are stored securely with verifiable ownership and provenance. This technology prevents unauthorised changes or misuse, protecting IKS from exploitation and plagiarism. Additionally, blockchain enables transparent intellectual property management, ensuring that communities contributing traditional knowledge such as Ayurvedic remedies or indigenous practices receive due recognition and benefits. Through its robust security and traceability features, blockchain

maintains the ethical preservation and dissemination of IKS globally. In order to solve issues with intellectual property and cultural appropriation, blockchain technology guarantees the validity and integrity of IKS resources.

- **Cultural Preservation:** By verifying the provenance and ownership of cultural artifacts, blockchain helps shield them from misuse.
- **Information Exchange:** Fair and transparent cooperation between academics, educators, and indigenous people are made possible by smart contracts, which guarantee equitable information sharing.

III Integrating IKS into Curriculums: Key Strategies

1. Creating Interdisciplinary Courses

IKS flourishes where several fields converge. Institutions of higher learning can create interdisciplinary curricula that combine traditional wisdom with contemporary science and technology. For example:

- **Ayurvedic Biology:** This course examines alternative therapeutic methods by fusing molecular biology and Ayurveda.
- **Ethics and Governance:** Teaching contemporary political science and public administration through the use of writings such as the Arthashastra.
- **Sustainable Architecture:** Eco-friendly building designs can be influenced by lessons learned from traditional Indian architectural techniques, such as those used in stepwells and temples.

2. Collaborating with Indigenous Communities

The intangible cultural legacy of India is being preserved by indigenous groups. Working together with these communities can improve educational initiatives:

- **Knowledge Sharing:** Ask experts in traditional crafts, medicine, and agriculture to share their knowledge.
- **Hands-on Training:** Give pupils practical experience in indigenous customs to help them respect and comprehend traditional knowledge.

3. Using Technology in Classrooms

Technology integration in the classroom can improve IKS instruction and learning:

- **Digital Libraries:** IKS writings and artifacts can be housed in digital repositories at educational institutions.
- **Virtual Labs:** Model experiments based on antiquated scientific theories, including alchemy or metallurgy.
- **Gamification:** Create interactive, entertaining instructional games that impart IKS concepts.

IV Case Studies: Successful Integration of IKS in Education

To explore the successful integration of Indian Knowledge Systems (IKS) in education, it is necessary to examine case studies that demonstrate how traditional knowledge can be effectively incorporated into modern educational frameworks. These examples provide valuable insights into the potential benefits of blending ancient knowledge with contemporary teaching practices. From academic institutions to grassroots initiatives, various models have emerged that highlight the transformative impact of IKS on students' learning experiences, fostering a deeper understanding of cultural heritage, ethics, and sustainability. Through these case studies, we can better understand the challenges faced and the strategies employed to overcome them, providing a roadmap for future implementation.

1. Nalanda University: Reviving Ancient Pedagogy

Inspired by its ancient namesake, Nalanda University is a contemporary university that integrates IKS into its curriculum by providing courses on sustainable development, environment, and Buddhism. Ancient knowledge and modern problems are connected through the use of digitized manuscripts and interdisciplinary research.

2. IIT Gandhinagar's Heritage Initiative

A historical project that combines IKS with contemporary engineering and technology has been started by IIT Gandhinagar. Courses on sustainable architecture and conventional water management techniques are included of the curriculum.

3. The Gurukula Model

Some educational establishments still adhere to the Gurukula model, which emphasizes academic courses combined with holistic learning via yoga, meditation, and moral behavior. These educational institutions are expanding their audience by incorporating technology.

V Challenges, Contributions, Solutions & research in Implementing IKS in Education

Integrating Indian Knowledge Systems (IKS) into contemporary educational frameworks faces several challenges, ranging from limitations of curriculum to social acceptance. However, challenges in implementing IKS in Education with several key solutions and contributions have been proposed, with ample opportunities for future research to enhance its implementation.

Challenges

- **Scarcity of Resources**

One major obstacle is still the absence of digital tools and qualified teachers. This deficit can be filled by funding teacher training initiatives and digitization efforts.

- **Opposition to Change**

Stakeholders used to traditional approaches may object to the integration of IKS into regular curricula. Campaigns for advocacy and awareness can highlight the advantages of this combination.

- **Moral Issues**

Concerns of cultural exploitation are brought up by the commercialization of IKS. Frameworks and policies that guarantee benefit-sharing and community involvement are crucial.

Key Solutions

- **Curriculum Integration**

One of the primary barriers is the lack of a structured curricular framework for incorporating IKS. To overcome this, educational policymakers should work on integrating IKS into school and university curricula in subjects such as philosophy, history, science, and cultural studies. This may include creating specific courses on IKS or modules within existing subjects such as ethics, sustainability, and cultural studies. Schools and universities can use multidisciplinary approaches that combine

IKS with modern scientific knowledge, ensuring that students appreciate both traditional and contemporary knowledge.

- **Teacher Training and Awareness**

Teachers play a vital role in effectively delivering IKS-based content. Special teacher training programmes focused on IKS will help teachers understand its relevance and find innovative ways to integrate it in their classrooms. Collaboration between IKS scholars and education experts can ensure that teachers are well-equipped to teach complex IKS concepts, using technology and modern pedagogical tools.

- **Use of Technology**

Leveraging technology is a powerful tool in overcoming the challenges of access and engagement. Digitising lessons, integrating virtual reality for experiential learning and using artificial intelligence to provide personalised learning experiences can make IKS more engaging and accessible. Platforms such as digital libraries and learning management systems can provide easy access to ancient texts, making them available to a global audience. In this regard, AI and blockchain technologies can also ensure the preservation, authenticity and dissemination of IKS content.

Contributions

- **Cultural Revival and Global Recognition**

Implementing IKS in education contributes to the cultural revival of ancient knowledge and its global recognition. As India and the world seek solutions to global challenges such as climate change, sustainable agriculture, and ethical governance, IKS offers valuable insights. Fields such as yoga, Ayurveda, and sustainable architecture have already contributed significantly to contemporary solutions, and their systematic inclusion in education can amplify this impact.

- **Ethical Framework and Sustainability**

IKS provides a holistic, ethical, and sustainable worldview that aligns with global movements for environmental responsibility and social justice. By incorporating principles such as vasudhaiva kutumbakam (the world is one family), ahimsa (nonviolence), and sustainable resource management into the educational curriculum, IKS fosters ethical leadership, compassion, and environmental conservation in future generations.

- **The Global Relevance of IKS in Education**

IKS provides a distinct viewpoint as the globe looks for long-term answers to urgent problems:

- **Yoga and Wellness:** Yoga has already gained international recognition for its ability to improve both mental and physical health.
- **Sustainable Practices:** Global initiatives to promote sustainability can be guided by traditional Indian methods for managing trash, conserving water, and farming.
- **Ethical Leadership:** Classical principles in ethics, leadership, and decision-making can be learned from Indian epics and texts.

VI Future research possibilities

- **Interdisciplinary research on modern applications of IKS**

Future research could explore the interconnections between IKS and modern fields of study. For example, how ancient sustainable agricultural practices from IKS could be applied to modern organic farming and agroecology. AI models and data analytics could also be used to examine how traditional medical knowledge (such as Ayurveda) aligns with modern healthcare practices, thus validating its relevance in contemporary times.

- **Collaboration with global education systems**

Research could focus on cross-cultural studies to see how IKS could be integrated into education systems outside India. This would include exploring how universal values inherent in IKS, such as ethical governance and sustainability, could resonate with global educational standards and curriculums. Further, interdisciplinary partnerships between Indian universities and global institutions can lead to joint research on the applicability of IKS in solving pressing global challenges.

- **Technology-driven innovation in IKS learning**

Future research can also focus on advancing technology to improve learning experiences based on IKS. Investigating the role of emerging technologies such as augmented reality (AR) and blockchain in enhancing IKS education can provide new, interactive ways for students to engage with this rich knowledge base. Research into creating AI-powered educational platforms that help make IKS teachings relevant to modern students is another promising area.

In conclusion, overcoming the challenges in implementing Indian Knowledge Systems (IKS) in education requires a multi-pronged approach that combines curriculum integration, teacher training, and technological advancements. This comprehensive strategy not only preserves IKS but also redefines its relevance in the modern world. Future research in areas such as interdisciplinary applications, technological innovations, and global collaborations holds immense potential. By focusing on these areas, IKS can contribute to solving contemporary global issues, strengthening ethical frameworks, and promoting sustainable development. Continued investment in these efforts will ensure that IKS remains a vital and dynamic part of global education, inspiring future generations.

Additionally, incorporating IKS into the current educational framework serves a dual purpose – preserving cultural heritage while offering solutions to modern-day challenges. Technology acts as a powerful enabler in bridging the gap between tradition and innovation, making IKS accessible and relevant. By fostering interdisciplinary collaboration, engaging indigenous communities, and leveraging contemporary tools, India can ensure that IKS continues to thrive in the global education landscape. This holistic approach will not only uplift the next generation but also promote sustainability and reaffirm India's intellectual heritage on the world stage.

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