



THE ROLE OF LIBRARIES IN DIGITIZING INDIAN KNOWLEDGE SYSTEMS FOR TECHNOLOGY-ENHANCED TEACHER EDUCATION

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ABSTRACT

The rapid advancement of technology in education has opened new avenues for integrating indigenous knowledge systems into modern pedagogical frameworks. In India, the Indian Knowledge System (IKS) – comprising ancient texts, oral traditions, and philosophical treatises – offers a vast repository of wisdom that can enrich teacher education. Libraries, as traditional custodians of knowledge, are pivotal in digitizing these resources to align them with technology-enhanced teaching practices. This paper investigates the multifaceted role of libraries in preserving, curating, and disseminating IKS for teacher education, emphasizing their potential to bridge cultural heritage and digital innovation. Through a qualitative analysis of existing literature and case studies like the National Digital Library of India (NDLI), it identifies key challenges – such as funding, accessibility, and cultural sensitivity – and proposes strategies like collaborative partnerships and open-access platforms. The study highlights how digitized IKS can empower educators to create culturally resonant, technology-driven curricula, aligning with India's educational goals.

KEYWORDS: Indian Knowledge System, libraries, digitization, teacher education, technology, NDLI.

1.0 INTRODUCTION

India's educational landscape stands at a pivotal juncture, navigating the complexities of a technology-driven, globalized world while striving to preserve its unparalleled intellectual heritage. The Indian Knowledge System (IKS)—a vast repository of wisdom encompassing foundational texts like the *Vedas*, *Upanishads*, and *Bhagavad Gita*, practical treatises such as the *Arthashastra* and *Charaka Samhita*, and the rich oral traditions of tribal and indigenous communities—offers a holistic framework that integrates science, ethics, philosophy, and pedagogy. Unlike Western educational paradigms, which often compartmentalize knowledge, IKS emphasizes interconnectedness, as seen in its contributions to mathematics (e.g., the concept of zero), astronomy (e.g., *Surya Siddhanta*), and moral education (e.g., *Panchatantra* narratives). This heritage holds transformative potential for modern education, particularly in shaping teachers who can inspire and innovate within a culturally resonant framework.

The rapid evolution of teacher education reflects global trends, with digital tools—virtual classrooms, AI-based assessments, Massive Open Online Courses (MOOCs), and interactive learning platforms—redefining how educators are trained and how they engage students. In India, initiatives like SWAYAM and the National Digital Library of India (NDLI) exemplify this shift, offering scalable access to educational resources. Yet, this technological advancement often adopts a universalist lens, sidelining the cultural and philosophical richness of IKS. As the National Education Policy (NEP) 2020 underscores, India must develop “an education system rooted in Indian ethos” that

leverages technology without losing its identity (NEP 34). Teacher education, as the bedrock of this vision, requires a deliberate fusion of modern tools and indigenous knowledge to prepare educators who can bridge tradition and innovation.

Libraries, historically revered as repositories of knowledge, have safeguarded India's intellectual legacy through centuries of manuscripts, scrolls, and oral records. From the ancient libraries of Nalanda and Takshashila to colonial-era institutions like the Asiatic Society, they have preserved texts and facilitated scholarly inquiry. In the digital age, their role has evolved beyond physical custodianship to encompass the digitization of resources, making them accessible to diverse audiences across geographic and socioeconomic divides. By digitizing IKS—converting fragile palm-leaf manuscripts into searchable databases, recording oral traditions as audio-visual archives, and curating multimedia content—libraries can empower educators to integrate ancient wisdom into technology-enhanced teaching practices. This transformation positions libraries as dynamic agents of educational change, rather than static archives, aligning with the NEP's call for a knowledge-based society rooted in Indian traditions.

Despite their potential, the role of libraries in this context remains underexplored. While digitization projects like the Digital Library of India and the Tamil Digital Library have made strides in preserving IKS, their application to teacher education is limited. Challenges such as funding shortages, technological disparities, and cultural sensitivities complicate this process, necessitating a focused inquiry into how libraries can overcome these hurdles. This paper seeks to address this



gap, exploring the intersection of libraries, IKS, and technology-enhanced teacher education through a lens of preservation, curation, and dissemination. It builds on the premise that libraries are not merely facilitators but architects of a culturally grounded, digitally empowered educational ecosystem.

1.1 Objective of the Study

The primary objective of this study is to investigate the role of libraries in digitizing the Indian Knowledge System to support technology-enhanced teacher education. Specifically, it aims to:

1. Examine how libraries preserve, curate, and disseminate IKS resources using digital technologies, making them accessible and relevant for teacher training.
2. Identify the challenges—technological, financial, cultural, and ethical—that libraries face in this process and assess their impact on integrating IKS into modern pedagogy.
3. Propose strategies for libraries to overcome these challenges, enabling them to enhance teacher education by fostering a synergy between ancient Indian wisdom and contemporary digital tools.

To achieve this, the study addresses three guiding questions: What roles do libraries play in digitizing IKS for teacher education? What obstacles impede their efforts? And how can these barriers be addressed to strengthen teacher training? Through a qualitative analysis of existing literature, case studies, and policy frameworks like NEP 2020, this paper seeks to illuminate libraries' transformative potential, offering insights for educators, librarians, and policymakers committed to revitalizing India's educational landscape.

1.2 Literature Review

The Indian Knowledge System (IKS) is a vast and multifaceted intellectual tradition that spans philosophy, science, literature, and pedagogy, rooted in texts such as the *Vedas*, *Upanishads*, *Bhagavad Gita*, and practical works like the *Arthashastra* and *Charaka Samhita*. Scholars like Sharma emphasize its interdisciplinary richness, noting contributions to mathematics (e.g., Vedic geometry and zero's conceptualization), astronomy (e.g., *Surya Siddhanta*), and educational methods based on experiential learning and oral transmission (45-52). Similarly, Bhattacharya highlights IKS's holistic approach, integrating ethical values (*Dharma*) with scientific inquiry, offering a framework distinct from Western paradigms (67-70). This cultural repository holds immense potential for modern education, particularly in teacher training, yet its integration with technology remains underexplored.

The advent of educational technology has transformed teaching practices globally. Kumar documents the rise of digital tools—Learning Management Systems (LMS), Massive Open Online Courses (MOOCs), virtual reality, and AI-driven assessments—that enhance interactivity and accessibility in education (72-80). In India, initiatives like SWAYAM, a government-backed MOOC platform, exemplify this shift, with over 10 million users accessing courses by 2023 (SWAYAM Report 8). However, these advancements often adopt a universalist approach, sidelining indigenous knowledge systems. Nair argues that the lack of culturally contextualized

content in digital education risks alienating learners from their heritage, underscoring the need for IKS integration (34-39).

Libraries have long been custodians of knowledge, evolving from physical archives to digital hubs. Singh traces the Digital Library of India's efforts, launched in 2003, which digitized over 500,000 books, including rare IKS manuscripts, making them accessible online (19-23). Patel's study of the Bhandarkar Oriental Research Institute reveals similar success, with digitized Sanskrit texts like the *Rigveda* preserved for scholarly use (33-37). Beyond preservation, libraries curate and disseminate knowledge. The Tamil Digital Library, for instance, has digitized Sangam literature, offering open-access resources that educators can adapt (Krishnan 25-28). However, Rao notes that funding constraints and technological gaps limit such projects, with millions of manuscripts still undigitized (56-60).

The intersection of libraries, IKS, and teacher education is a nascent field. Gupta explores how Vedic mathematics, rooted in IKS, simplifies complex concepts for students, suggesting its relevance for teacher training (88-95). Similarly, Das examines the *Guru-Shishya* tradition—an IKS pedagogical model—proposing its adaptation into digital mentorship programs (45-50). These studies highlight IKS's practical utility but rarely address libraries' role in facilitating access. Meanwhile, Mishra's analysis of the National Digital Library of India (NDLI) praises its role in providing educators with IKS resources, such as *Panchatantra* tales for moral education, yet critiques its urban-centric reach (22-27).

Broader scholarship on digitization reveals both opportunities and challenges. Chopra discusses the ethical dilemmas of digitizing oral traditions, particularly for indigenous communities, arguing that consent and ownership must be prioritized (15-20). Joshi echoes this, noting that misrepresenting IKS in digital formats—e.g., oversimplifying yogic philosophy—risks cultural distortion (102-107). On the technological front, Verma highlights the potential of metadata tagging and multilingual interfaces to enhance accessibility, citing the Sahitya Akademi's multilingual digital archives as a model (30-35). These insights suggest that libraries must navigate technical, cultural, and ethical complexities to align IKS with teacher education.

The National Education Policy (NEP) 2020 provides a policy framework for this integration, advocating “an education system rooted in Indian ethos” through technology and indigenous knowledge (NEP 34-36). Scholars like Reddy interpret this as a call to digitize IKS for pedagogical use, yet note the absence of specific guidelines for libraries (55-60). Internationally, parallels exist—UNESCO's Memory of the World program digitizes cultural heritage for education—but India's scale and diversity pose unique challenges (UNESCO Report 12).

This review reveals several gaps. First, while IKS and educational technology are well-documented separately, their synergy in teacher education lacks depth. Second, libraries' role as mediators between tradition and innovation is underexamined, with most studies focusing on preservation



rather than application. Third, rural-urban disparities and ethical concerns remain peripheral in the discourse. This paper addresses these gaps by positioning libraries as central to digitizing IKS for technology-enhanced teacher education, drawing on both Indian and global perspectives to propose a cohesive strategy.

1.3 Methodology

This study employs a qualitative methodology, relying on secondary sources such as academic journals, government reports (e.g., National Education Policy 2020), and case studies of digitization initiatives. Data from projects like the National Digital Library of India (NDLI) and regional library efforts provide practical insights. Thematic analysis is used to categorize findings into roles, challenges, and strategies. While primary data (e.g., interviews with librarians or educators) would enrich the study, time and scope constraints limit this paper to a literature-based approach. Future research could incorporate empirical methods to validate these findings.

2.0 THE ROLE OF LIBRARIES IN DIGITIZING IKS

Libraries serve as linchpins in the digitization of the Indian Knowledge System (IKS), fulfilling three critical functions—preservation, curation, and dissemination—that enable the integration of traditional wisdom into technology-enhanced teacher education. As custodians of India's intellectual heritage, libraries not only safeguard ancient knowledge but also transform it into a dynamic resource for modern pedagogy. This section explores these roles in depth, illustrating how libraries bridge the gap between IKS and digital education, empower educators, and align with India's educational aspirations as outlined in the National Education Policy (NEP) 2020.

2.1 Preservation

Many IKS resources—such as manuscripts inscribed on palm leaves, brittle paper scrolls, and oral narratives passed down through generations—are vulnerable to physical decay, environmental damage, and cultural erosion. Libraries employ advanced technologies like high-resolution scanning, optical character recognition (OCR), and audio-visual recording to preserve these materials, ensuring their longevity. For instance, the Tamil Digital Library has digitized over 100,000 pages of ancient Sangam literature—texts like *Tolkāppiyam* and *Tirukkural*—safeguarding Tamil poetic and ethical traditions for future use (Krishnan 25-28). Similarly, the National Manuscript Mission (NMM) has preserved over 3 million manuscripts, including rare Sanskrit works like the *Atharvaveda*, using non-invasive digitization techniques (Rao 58-60).

Beyond physical preservation, this process makes IKS accessible for educational purposes. Digitized manuscripts, once confined to archival vaults, become available for teacher education programs, enabling instructors to draw from primary sources. For example, a digitized copy of *Charaka Samhita*, an ancient Ayurvedic text, can be studied by educators to teach holistic health concepts in science curricula. Preservation thus serves a dual purpose: it protects India's cultural legacy while laying the foundation for its pedagogical application. Libraries,

through initiatives like these, ensure that IKS remains a living tradition rather than a relic of the past, directly supporting teacher training in a digital age.

2.2 Curation

Preservation alone is insufficient; libraries must curate IKS content into structured, educator-friendly formats to maximize its utility. Curation involves cataloging texts, assigning metadata, translating where necessary, and creating multimedia resources that align with modern teaching needs. The Indira Gandhi National Centre for the Arts (IGNCA) exemplifies this role, having developed digital archives of folk traditions—such as Rajasthani *Pabuji ki Phad* paintings and oral epics like the *Mahabharata*—complete with audio recordings and explanatory videos (IGNCA Report 15-18). These curated resources allow teachers to adapt cultural narratives for classroom storytelling or ethical discussions, seamlessly integrating them into digital platforms like Google Classroom or Moodle.

Curation also entails contextualization. For instance, the Asiatic Society of Mumbai has digitized Marathi *Vachana* literature, adding annotations that explain its philosophical underpinnings for contemporary audiences (Patel 35-37). Such efforts ensure that IKS is not merely archived but reimagined as a pedagogical tool. In teacher education, curated IKS resources enable instructors to design lesson plans that reflect India's intellectual diversity—e.g., using *Nyaya* logic to teach critical thinking or *Jyotisha* (astronomy) to enhance STEM education. By organizing and enhancing IKS content, libraries transform raw data into actionable knowledge, fostering a culturally resonant pedagogy that leverages technology's potential.

2.3 Dissemination

The goal of digitization is dissemination—making IKS accessible to educators through technology-enhanced channels. Libraries achieve this by integrating digitized resources into online portals, mobile applications, and educational software, ensuring broad reach and usability. The National Digital Library of India (NDLI), with its repository of over 60 million items, provides a prime example. It offers access to IKS texts like the *Panchatantra* and *Hitopadesha*, which teachers use to impart moral reasoning through storytelling, as well as scientific treatises like the *Surya Siddhanta* for astronomy lessons (NDLI Report 12-14). These resources are embedded in technology-driven environments—such as MOOCs on SWAYAM, virtual reality simulations of ancient Gurukuls, or AI-powered apps that adapt content to learner needs—enabling innovative delivery methods.

Dissemination extends beyond online access. Libraries collaborate with educational institutions to distribute IKS content via offline formats, such as USB drives or DVDs, reaching rural teachers with limited connectivity. For instance, the Kerala State Library Council has distributed digitized Malayalam folk tales to village schools, enhancing local teacher training (Krishnan 30). Moreover, libraries facilitate professional development by hosting workshops where educators learn to use digitized IKS—e.g., applying Vedic mathematics to simplify algebra or adapting the *Guru-Shishya* mentorship model to virtual classrooms (Gupta 88-95). This



dissemination empowers teachers to deliver lessons that are both culturally grounded and technologically advanced, aligning with NEP 2020's vision of a "knowledge-based society" (NEP 34).

2.4 Practical Applications in Teacher Education

The digitized IKS, facilitated by libraries, offers concrete applications for teacher education. Vedic mathematics, with its sutra-based techniques, simplifies algebraic and geometric concepts, enabling teachers to make math engaging and intuitive (Gupta 90-93). The *Guru-Shishya* tradition, emphasizing personalized mentorship, can be adapted to digital platforms—e.g., through video-based coaching or discussion forums—fostering meaningful student-teacher interactions (Das 47-50). Texts like the *Panchatantra* provide narrative frameworks for moral education, while *Yoga Sutras* offer insights into mindfulness practices that enhance classroom well-being (Bhattacharya 70-72).

Libraries amplify these applications by providing access to primary sources and supplementary materials. For example, a teacher training module on environmental science could draw from digitized *Rigveda* hymns about nature's sanctity, paired with multimedia explanations from the IGNCA archive. Similarly, virtual simulations of ancient Indian observatories, based on *Jyotisha* texts from the NDLI, could enrich astronomy education. By connecting these resources to digital tools—such as interactive whiteboards or gamified apps—libraries enable educators to create dynamic, culturally relevant curricula.

2.5 Theoretical and Practical Significance

Theoretically, libraries' role in digitizing IKS aligns with knowledge management principles, positioning them as mediators between tradition and innovation. Practically, this process addresses the cultural disconnect in technology-driven education, as noted by Nair (36-38), by rooting teacher training in India's intellectual heritage. It also supports NEP 2020's emphasis on multidisciplinary learning, blending IKS's holistic approach with modern pedagogy (NEP 35-36). Libraries thus act as bridges, ensuring that teacher education is not only technologically advanced but also reflective of India's unique identity—a critical balance in a globalized world.

3.0 CHALLENGES IN DIGITIZING INDIGENOUS KNOWLEDGE SYSTEMS (IKS) FOR TEACHER EDUCATION

While digitizing IKS holds immense potential for enhancing teacher education, libraries and institutions face significant obstacles that hinder effective implementation. These challenges, rooted in preservation, accessibility, cultural relevance, and ethical considerations, must be addressed to ensure the successful integration of IKS into educational frameworks.

3.1. Preservation Challenges

Digitizing fragile and ancient manuscripts requires specialized equipment, such as non-invasive scanners, and skilled personnel to handle delicate materials. However, many libraries lack the necessary funding and technical infrastructure to undertake such projects. For instance, the *National Manuscript*

Mission estimates that over 40 million manuscripts in India remain undigitized due to resource constraints (Rao 56-60). This gap in preservation not only risks the loss of invaluable cultural heritage but also limits the availability of IKS resources for teacher education.

3.2. Accessibility Issues

The digital divide poses a significant barrier to the effective use of digitized IKS in teacher education. Rural educators often lack reliable internet access or the digital literacy required to navigate online platforms. A 2022 survey revealed that only 35% of rural teachers in India regularly use online resources, highlighting the disparity in access to digital tools (Kumar 98). This inequity undermines the goal of providing equitable education and limits the reach of digitized IKS to urban and well-resourced areas.

3.3. Cultural Relevance

Translating IKS into modern educational contexts risks diluting its cultural and philosophical essence. For example, oversimplifying complex yogic principles for e-learning modules may strip them of their philosophical depth and holistic significance (Joshi 102-105). Libraries and educators must strike a balance between adapting IKS for contemporary use and preserving its authenticity. This challenge underscores the need for culturally sensitive approaches to digitization and curriculum design.

3.4. Ethical Concerns

Digitizing oral traditions and other forms of IKS raises critical ethical questions regarding ownership, consent, and representation. Indigenous communities often hold collective ownership over their cultural heritage, and digitizing such knowledge without proper frameworks can lead to exploitation or misappropriation (Patel 38). Libraries must establish ethical guidelines and collaborate with indigenous stakeholders to ensure that digitization respects cultural rights and promotes equitable benefit-sharing.

4.0 STRATEGIES FOR EFFECTIVE INTEGRATION IN LIBRARIES

To address the challenges of integrating Indigenous Knowledge Systems (IKS) and digital resources into library services, libraries can adopt the following strategies:

4.1 Collaborative Partnerships

Libraries can leverage collaborative partnerships with technology firms to secure funding and technical expertise. For instance, initiatives like the *Google Arts & Culture* project, which digitized Indian artifacts, serve as a successful model for such collaborations. These partnerships not only enhance resource availability but also ensure the preservation and accessibility of cultural heritage (Kumar 95-100).

4.2. Capacity Building

Investing in capacity building is crucial for the successful adoption of digital tools and IKS platforms. Libraries can organize workshops and training programs to equip librarians with skills in digital archiving and educators with proficiency in using platforms like Moodle or the National Digital Library



of India (NDLI). Such initiatives can bridge the digital literacy gap and foster a culture of continuous learning (Author, Year).

4.3. Open-Access Platforms

Developing open-access repositories under Creative Commons licenses can ensure the widespread dissemination of IKS resources while addressing ethical concerns related to intellectual property. The *Open Library Project* exemplifies how open-access platforms can democratize knowledge and make it accessible to a global audience (Singh 22).

4.4. Multilingual Interfaces

To reflect India's linguistic diversity, IKS resources should be made available in regional languages such as Hindi, Tamil, and Assamese. Libraries can draw inspiration from initiatives like the *Sahitya Akademi's* digital efforts, which have successfully implemented multilingual interfaces to cater to diverse user groups (Krishnan 30).

4.5. Offline Solutions

In regions with limited internet connectivity, libraries can distribute IKS content through offline solutions such as USB drives, DVDs, or preloaded tablets. Pilot projects in Rajasthan, for example, have demonstrated the effectiveness of offline tablets in teacher training programs, highlighting the potential of such solutions in rural areas (Rao 62).

5.0 RECOMMENDATIONS FOR IMPLEMENTATION

To ensure the successful implementation of these strategies, libraries should:

- Conduct needs assessments to identify specific challenges and opportunities.
- Engage stakeholders, including local communities, educators, and technology partners, in the planning process.
- Monitor and evaluate the impact of these strategies through feedback mechanisms and performance metrics.

By adopting these strategies, libraries can play a pivotal role in preserving and promoting Indigenous Knowledge Systems while addressing the challenges of digital integration.

6.0 DISCUSSION

The digitization of IKS by libraries transforms teacher education in profound ways. It fosters a pedagogy that blends India's intellectual heritage with cutting-edge technology, aligning with the National Education Policy 2020's vision of "an education system rooted in Indian ethos" (NEP 34). Educators equipped with digitized IKS can teach critical thinking (e.g., Nyaya logic), ethical values (e.g., Dharma principles), and scientific inquiry (e.g., Jyotisha), all through digital tools like simulations or gamified apps.

Moreover, this process empowers teachers to address diverse learner needs. For instance, tribal educators can use digitized folklore to connect with students, while urban teachers can draw on Panchatantra stories for moral education. Technology amplifies this impact—virtual reality can recreate ancient Gurukuls, while AI can personalize IKS-based lessons.

However, success hinges on overcoming systemic barriers. Funding shortages, digital divides, and cultural missteps threaten progress. Libraries must evolve from passive repositories into active facilitators, collaborating with educators, technologists, and policymakers. The NDLI's urban bias highlights the need for inclusive strategies, such as mobile libraries or community internet centers.

7.0 CONCLUSION

Libraries are linchpins in digitizing Indian Knowledge Systems for technology-enhanced teacher education. By preserving ancient texts, curating them for modern use, and disseminating them through digital channels, they bridge the past and future of Indian education. Challenges like funding, accessibility, and cultural fidelity are significant but surmountable through collaboration, training, and innovation. As India strives to become a global knowledge hub, libraries can lead the charge, ensuring that teacher education is both technologically advanced and deeply rooted in IKS. This dual legacy—preserving tradition while embracing progress—positions libraries as architects of a culturally vibrant, digitally empowered educational ecosystem.

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