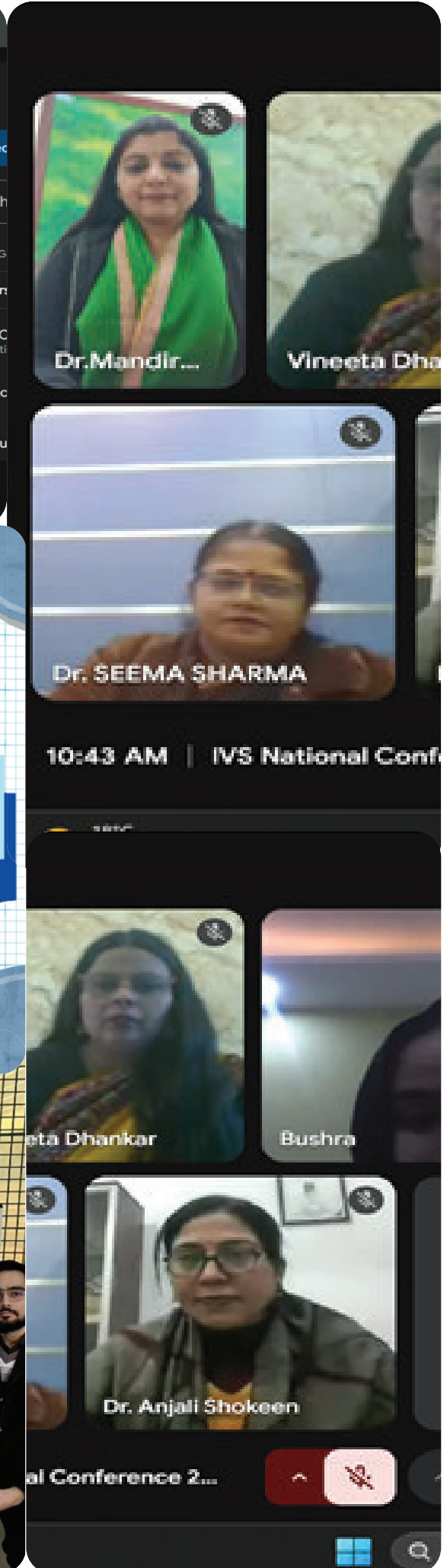**PROCEEDINGS**
NATIONAL CONFERENCE
(Under IQAC Cell)

INDIAN KNOWLEDGE SYSTEM IN TEACHER EDUCATION: BRIDGING TRADITION AND MODERNITY

20th January, 2026

Institute of Vocational Studies
(A Unit of Awadh Public Charitable Trust)
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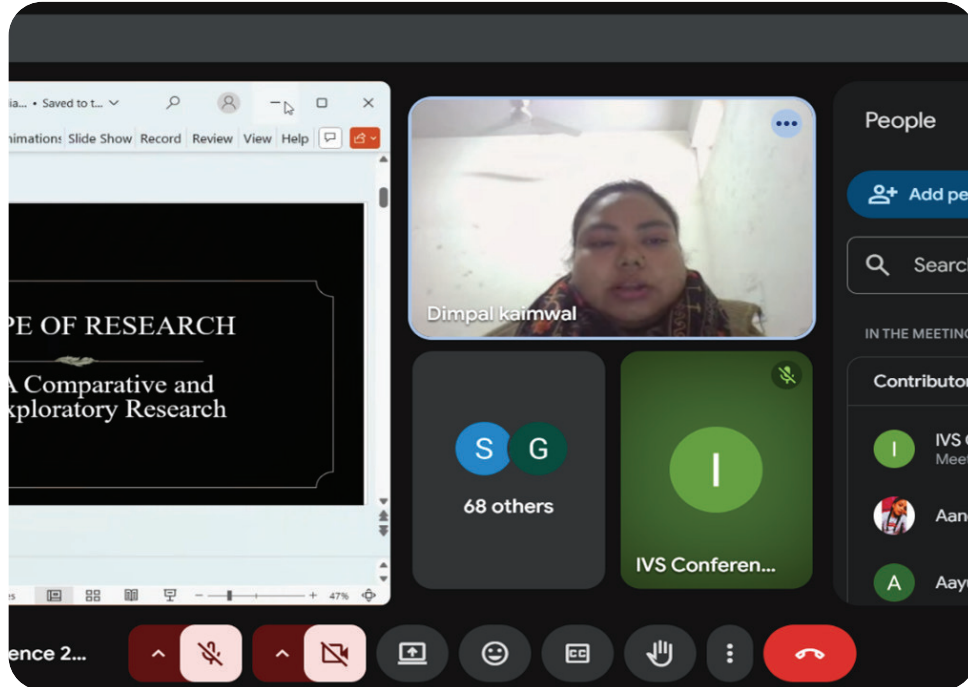Affiliated to GGSIP Indraprastha University & SCERT, Delhi

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Convenor

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Dr. Zainul Abedin Shamsi

Principal's Message

It gives me immense pleasure to present this volume of conference proceedings based on the theme **"Indian Knowledge System in Teacher Education: Bridging Tradition and Modernity."** The theme is both timely and significant, as teacher education today stands at a critical intersection of rich indigenous wisdom and rapidly evolving contemporary pedagogies.

The Indian Knowledge System embodies centuries of educational thought rooted in values, ethics, experiential learning, and holistic development. When meaningfully integrated with modern scientific approaches, technology, and global perspectives, it has the potential to enrich teacher education in profound ways. This conference has provided a valuable platform for scholars, teacher educators, researchers, and practitioners to critically engage with this integration, explore innovative practices, and reimagine teacher preparation for the 21st century.

The papers compiled in these proceedings reflect deep scholarly inquiry, thoughtful reflection, and practical insights into how tradition and modernity can coexist, complement, and strengthen each other in teacher education. I am confident that this compilation will serve as a useful academic resource and inspire further research, dialogue, and innovation in the field.

I extend my sincere appreciation to the contributors, reviewers, organizing committee, and all participants whose collective efforts have made this academic endeavour meaningful and successful. May these proceedings contribute to nurturing reflective teachers who are grounded in India's intellectual heritage while being fully prepared to meet contemporary educational challenges.

Wishing you all a successful and insightful conference!

Dr. Mandira Gupta
Principal
Institute of Vocational Studies

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INTEGRATING INDIAN KNOWLEDGE SYSTEMS WITH STEM IN TEACHER EDUCATION: BRIDGING TRADITION AND INNOVATION

Ms. Sapna Raj*

Dr. Aerum Khan**

ABSTRACT

The integration of Indian Knowledge Systems (IKS) with modern STEM education offers a powerful opportunity to enhance the relevance and inclusivity of educational practices. While STEM education predominantly focuses on the technical and scientific domains, incorporating indigenous knowledge into this framework can provide a culturally enriched approach that resonates with diverse student populations. Despite this potential, the integration of IKS into STEM teacher education remains underexplored, leaving an important gap in both teacher preparation and curriculum development.

This paper examines how bridging ancient wisdom, embedded in IKS, with modern STEM education can foster a more holistic, culturally responsive approach to teacher education. By incorporating elements such as Ayurveda, Yoga, and traditional Indian philosophies, this approach aims to enhance educators' ability to teach STEM concepts in a way that is both academically rigorous and culturally relevant.

The study synthesizes existing research and theoretical perspectives on IKS and STEM education, drawing from a variety of scholarly articles, case studies, and expert opinions (Google Scholar, Research Gate, ERIC, Teacher Reference Centre, and Education Source). The analysis focuses on the current challenges in STEM teacher education, particularly the lack of integration between modern and traditional knowledge systems and offers insights into how IKS can be effectively woven into STEM curricula. Its also talks about opportunities. The integration of IKS into STEM teacher education offers multiple benefits. It encourages a more inclusive teaching model that reflects diverse cultural perspectives, fostering deeper connections between students and the subject matter. The review also highlights the role of IKS in promoting emotional and cognitive development, particularly through traditional practices such as Yoga and mindfulness. Furthermore, incorporating local knowledge helps students engage more meaningfully with STEM

concepts, making them more relatable and accessible. Enhancing teacher competencies through professional development programs focusing on experiential learning, gamification, and interdisciplinary TLMs. Promote research on STEM-IKS frameworks to assess their impact on learning outcomes and cultural awareness, while adapting global best practices for the Indian context. Advocate for policy-level support to align curricula with NEP 2020, secure funding, and mobilize resources for underserved schools. Foster collaborative implementation models by engaging educators, researchers, and community leaders, piloting programs in diverse settings, and developing open-access platforms for nationwide dissemination. This approach can enrich STEM education, making it more inclusive, sustainable, and aligned with the values of diverse communities, while also enhancing the teacher's role as a facilitator of holistic learning.

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INTRODUCTION

STEM education is undergoing a significant transformation worldwide, transitioning from a subject-specific focus to a more integrated and interdisciplinary framework. This evolution underscores the interconnectedness of science, technology, engineering, and mathematics, highlighting their collective role in addressing complex, real-world problems. Global trends reveal a strong emphasis on STEAM education, which incorporates the arts to foster creativity and innovation, with countries like the United States, Australia, and South Korea leading in adopting design-based, cross-disciplinary learning approaches. Curricula are increasingly aligning with global challenges, as reflected in the influence of the United Nations Sustainable Development Goals (SDGs), promoting STEM education geared toward climate action, sustainable development, and public health solutions. Technological integration in classrooms is another critical trend, with Finland and Singapore spearheading initiatives to teach artificial intelligence, coding, and robotics at early educational stages. Innovations like gamification and virtual reality (VR) are creating immersive learning experiences that enhance computational thinking and problem-solving. Equity and inclusivity are at the forefront of global STEM policies, with initiatives such as UNESCO's "Girls in STEM" addressing gender disparities and countries like

Canada and New Zealand focusing on inclusive education for indigenous and marginalized communities. Furthermore, indigenous knowledge systems (IKS) are increasingly being woven into STEM education to enrich learning and contextualize scientific concepts culturally. For example, New Zealand's curriculum incorporates Māori environmental wisdom, while Australia's education system draws on Aboriginal astronomy and land management practices. Industry collaborations and work-based learning models, such as Germany's dual education system and Japan's partnerships with vocational training institutes, ensure students gain practical, job-ready skills in fields like robotics and automotive engineering. Policies such as the Next Generation Science Standards (NGSS) in the United States and India's National Education Policy (NEP) 2020 reflect the global push for interdisciplinary and inquiry-based STEM education. These frameworks encourage blending modern technology with traditional knowledge, as seen in India's Atal Tinkering Labs, where students integrate 3D printing with indigenous concepts in architecture and agriculture. International collaborations, such as the European Union's Horizon Europe program, further exemplify the shift toward interdisciplinary research in fields like bioinformatics and nanotechnology. These trends highlight a global commitment to reimagining STEM education through collaboration, cultural integration, and real-world applications, ensuring students are well-prepared to tackle future challenges while embracing a holistic and inclusive approach to learning.

REVIVAL OF IKS AS A SOURCE OF HOLISTIC EDUCATIONAL PRACTICES

The National Education Policy (NEP) 2020 promotes a holistic and multidisciplinary approach to education, blending traditional and modern knowledge systems to provide a well-rounded, culturally rich learning experience. It emphasizes the preservation and integration of India's cultural heritage into the curriculum, ensuring that traditional wisdom is passed down to future generations. The policy also advocates for the inclusion of local traditions, languages, and practices, making education more inclusive and relevant to students from diverse backgrounds. In terms of research and development, NEP encourages the establishment of centers to study the Indian Knowledge System (IKS), contributing to innovation and expanding global knowledge. The policy promotes teaching in the mother tongue, especially in early education, to better convey traditional knowledge and strengthen cultural connections. It stresses the importance of equipping teachers with the necessary skills to integrate IKS into their teaching practices. Lastly, the NEP

recommends curricula that combine modern subjects with IKS, focusing on experiential and holistic learning to foster a comprehensive education system.

Holistic education, as envisioned in the Indian Knowledge System, emphasizes the development of the intellectual, emotional, social, and physical aspects of an individual. It moves beyond academic achievements to include character-building, values, and ethics, promoting the overall well-being of students. The IKS incorporates practical knowledge like language, mathematics, and vocational education, alongside physical activities such as yoga and discipline, and spiritual teachings from the Vedas and philosophy. This integrated approach helps address contemporary challenges faced by students, such as academic stress, anxiety, and burnout. Ayurveda nurtures the body, yoga purifies the mind, and teachings from the Dharmashastras guide ethical living. The epics, like the Ramayana and Mahabharata, impart life lessons in discipline, resilience, empathy, and emotional strength. Figures from these epics, such as Rama, Hanuman, Krishna, and Draupadi, serve as role models, demonstrating qualities like confidence, emotional resilience, and compassion. The Bhagavad Gita further contributes by offering profound insights on self-awareness, emotional control, and interpersonal skills, helping individuals grow personally and build harmonious relationships. Integrating these aspects into modern education can create well-rounded individuals, better equipped to navigate life's challenges with resilience and confidence (Pandya, 2014).

Table-1: Evolution of Education in India: IKS and STEM Integration

S. No.	Time Period	Purpose of Education	Characteristics of Education
1	**Brahmanical System of Education**	Holistic development—physical, mental, spiritual, and ethical growth; integration of knowledge with daily life.	Gurukul system emphasizing Sravan (listening), Manana (reflection), and Niddhyasana (deep contemplation); Sanskrit as medium.

2	**Ancient Indian Education (Buddhist Education)**	Ethical living, mindfulness, and community welfare; blending thought and action.	Universities like Nalanda and Takshashila provided structured yet flexible curricula; Pali/Prakrit languages facilitated access.
3	**Medieval Period**	Preservation of knowledge, cultural and religious education, and advancement in applied sciences.	Emphasis on theology combined with practical sciences in Madrasas; holistic education including moral and intellectual development.
4	**Colonial Period**	Dissemination of Western ideas, administrative skill-building, and marginalization of indigenous education systems.	Introduction of rote learning, English-medium instruction, and vocational training. IKS was often ignored or deemed irrelevant.
5	**Post-Independence**	Socio-economic development, equitable access, and revival of cultural heritage through education.	National Education Policies emphasized inclusive education, vocational training, and cultural revival through Indian heritage themes.
6	**21st Century**	Lifelong learning, skill development, global innovation, and environmental responsibility through interdisciplinary approaches.	Focus on STEM/STEAM integration with AI, robotics, and e-learning; acknowledgment of IKS for cultural relevance and contextual education.

LITERATURE REVIEW

Abbasi (2024) emphasizes that NEP 2020 advocates for a holistic, multidisciplinary approach that incorporates cultural heritage, local contexts, and mother tongue instruction while underscoring the importance of research and teacher training in IKS. The UGC guidelines complement this vision by encouraging the establishment of IKS centers, interdisciplinary curriculum design, faculty development, and partnerships with traditional knowledge practitioners. Abbasi argues that embedding IKS into teacher education enriches educational content, fosters cultural competence, and prepares educators to meet diverse student needs, aligning with NEP 2020's goal of a culturally responsive and inclusive education system. **Sharma and Rai (2024)** emphasize the integration of the Bhartiya Knowledge Tradition with holistic education as a means to balance traditional wisdom and contemporary teaching methodologies, fostering moral values, cultural awareness, and spiritual growth among Generation Z. They argue that this approach can rejuvenate India's educational system, enabling Bharat to reclaim its status as "Vishwa Guru." Recent literature explores the indigenization of modern scientific knowledge systems and the implementation of contextualized learning approaches. These efforts aim to merge age-old experiential wisdom with contemporary Western pedagogies and teaching-learning practices **(da Silva et al., 2023a, 2023b; Jima, 2022; Mavuso et al., 2021)**. **Ortiz-Revilla, Greca, and Adúriz-Bravo (2019)** discuss the evolution of STEM education, highlighting the shift from a mono-disciplinary approach to integrated STEM education. They emphasize the importance of inter-disciplinarity and the educational benefits of inquiry-based, project-based, and engineering design methodologies **(Brown, 2012; Bybee, 2013; Capraro et al., 2013)**. However, they also call for a deeper philosophical reflection on the epistemological foundations of integrated STEM education (Chesky & Wolfmeyer, 2015; Garibay, 2015). **Biswas and Mukherjee (2023)** discuss the evolution of teacher education in India, highlighting the shift from a religiously centered system to a more modern framework governed by the National Council for Teacher Education and the University Grants Commission. The paper also contrasts India's teacher education system with global perspectives, emphasizing the socio-economic and political influences that have shaped it over time.

RESEARCH METHODOLOGY

This paper employs a comprehensive review of scholarly literature, policy documents, and case studies to explore the integration of STEM education and Indian Knowledge Systems (IKS). Data was sourced from academic databases such as Google Scholar, Scopus, and ERIC, alongside policy frameworks like NEP 2020 and reports from educational institutions. Thematic analysis was conducted to examine the historical evolution, philosophical underpinnings, global practices, and current educational challenges and opportunities related to STEM-IKS integration.

In addition, the research incorporates comparative case analysis, drawing insights from global and Indian examples of STEM integration with traditional and indigenous knowledge systems. Particular emphasis was placed on state and institutional initiatives promoting IKS, the role of educational technology in scaling its application, and the redesign of teacher education frameworks. Challenges and opportunities were analyzed to provide actionable recommendations for effectively embedding IKS into STEM education, fostering a holistic and culturally responsive learning environment.

HISTORICAL AND PHILOSOPHICAL UNDERPINNINGS OF STEM AND IKS

The historical and philosophical underpinnings of STEM education are rooted in the mid-20th century when science, technology, and mathematics gained prominence due to global events such as World War II and the launch of *Sputnik* in the 1950s. These milestones spurred a focus on scientific and technological advancements, leading to the establishment of organizations like the National Science Foundation (NSF) and subsequent educational reforms to enhance competitiveness in the global economy (Bybee, 2013; Sanders, 2008). By the 1990s, the NSF formalized the acronym *STEM* to describe initiatives integrating science, technology, engineering, and mathematics. Philosophically, STEM emerged as a response to society's increasing reliance on innovation and problem-solving, emphasizing the role of education in equipping individuals to tackle real-world challenges. This shift also connected to earlier movements like *Science-Technology-Society* (STS), which highlighted the interplay between scientific advancements and their societal implications (English & King, 2015). According to Brown et al. (2011) and Bybee (2010), STEM education is an interdisciplinary approach that integrates science, technology, engineering, and mathematics, emphasizing the interconnectedness of these subjects rather than

treating them as isolated fields. This integration is essential for preparing students to be critically literate citizens who can contribute to the global economy.

In the current global perspective, STEM education has evolved to address 21st-century challenges such as economic competitiveness, sustainability, and workforce development. Programs such as STEAM (adding arts to STEM) have gained traction, particularly in compulsory education, fostering creativity alongside technical skills to prepare students for complex, real-world problems (Quigley & Herro, 2016). In today's competitive job market, students must have a clear understanding of STEM curricula that link these disciplines, fostering skills such as problem-solving, critical thinking, and innovation. This approach ensures that students are equipped with the knowledge and capabilities required to secure future employment opportunities and thrive in industries where the boundaries between these fields are increasingly blurred. By linking the real-world applications of STEM to the learning process, students gain not only theoretical knowledge but also the practical skills necessary to navigate complex challenges and participate in global economic growth (Brown et al., 2011; Bybee, 2010). Countries worldwide are prioritizing STEM to align with technological advancements such as artificial intelligence, automation, and digital transformation. This trend reflects the demand for critical thinking, collaboration, and adaptability, positioning STEM education as a cornerstone for addressing issues like climate change, global inequality, and innovation-driven economies. Philosophically, STEM represents not only a response to technological progress but also a pathway to equitable, inclusive, and future-ready education systems globally (Bybee, 2013; Sanders, 2008).

Indian Knowledge Systems (IKS) is an innovative division under the Ministry of Education (MoE), established at AICTE, New Delhi, in October 2020. It aims to promote interdisciplinary research, preserve, and disseminate traditional Indian knowledge for societal and academic applications. IKS focuses on diverse fields such as arts, literature, sciences, technology, agriculture, architecture, management, and wellness. The vision of the IKS Division is to rejuvenate and mainstream Indian Knowledge Systems in contemporary education and society. Its core objective is to decolonize the Indian mindset by fostering interest and critical reverence for India's rich and unbroken knowledge traditions, ensuring their relevance in the modern world for global welfare. IKS is particularly relevant to **STEM education** as it integrates indigenous knowledge with modern scientific principles, offering a holistic approach to teaching and learning.

For example, Vedic mathematics enhances problem-solving skills, while traditional Indian advancements in astronomy, Ayurveda, and engineering provide valuable insights into applied sciences and technology. By connecting STEM concepts to real-world applications rooted in India's knowledge heritage, IKS fosters innovation, critical thinking, and interdisciplinary learning among students. For teacher education, IKS equips educators with culturally relevant pedagogical tools and teaching methods, enabling them to integrate indigenous content with modern curricula effectively. Programs such as the inclusion of political concepts from texts like the Ramayana, Mahabharata, and Arthashastra, as well as courses on consciousness and well-being, help teachers adopt innovative instructional strategies that engage students meaningfully.

Aligned with the National Education Policy (NEP) 2020, IKS ensures the integration of traditional knowledge into educational frameworks at all levels. The University Grants Commission (UGC) mandates 5% of credits in undergraduate and postgraduate programs to be IKS-based, promoting topics such as Indian astronomy, yoga, Vedic mathematics, and classical arts. Initiatives like **Bharatiya Khel** promote traditional Indian games in schools, while collaborations with institutions such

Figure 1.1 Essence of IKS

as IIT Roorkee, IIT Mandi, and various state universities have led to specialized courses and research programs. This integration not only preserves India's knowledge heritage but also nurtures culturally rooted innovation, enhances the quality of STEM education, and empowers teachers with tools to deliver holistic, interdisciplinary learning. In essence, IKS bridges ancient Indian wisdom with modern education, fostering innovation, cultural pride, and critical engagement to meet the demands of 21st-century education.

The NCF emphasizes the integration of **Indian Knowledge Systems (IKS)** to create an education system rooted in India's cultural and philosophical heritage. It highlights the rich **epistemic traditions** of Indian schools of thought, such as the *pramana-shastras*, which explore the theory of knowledge and ways of knowing, distinguishing various philosophical traditions like *Vaisesika* and *Yogacara*. A **holistic vision of education** is drawn from India's ancient heritage and modern

thinkers, focusing on the centrality of the **guru-shishya tradition** that fosters strong teacher-student relationships through dialogue and debate. Local resources, such as language, practices, histories, and the environment, are utilized as tools for enriched, contextual learning. Indian contributions to fields like Mathematics, Environmental Education, and Ethics are incorporated throughout the curriculum to enrich subject matter—for instance, the story of zero's discovery, India's conservation traditions, and values like *seva* (service) and *swacchata* (cleanliness). Educational content, including stories, art, and games, is designed to reflect local and cultural contexts, maximizing creativity, comprehension, and relevance. This approach not only enriches learning but also instils pride, cultural identity, and self-confidence among students while addressing contemporary educational needs. The NCF proposes an **elective course on Indian Knowledge Systems (IKS)** for Grades 11 and 12 to deepen students' understanding of India's rich knowledge traditions. This course, inspired by the existing *Knowledge Traditions and Practices of India (KTPI)*, includes modules on philosophical systems, literature, mathematics, astronomy, Ayurveda, environmental conservation, ethics, architecture, music, dance, martial arts, and more. Each module comprises a survey of the field, activities, further readings, and primary texts.

The content will be revised to a more advanced level, particularly for subjects like mathematics, astronomy, chemistry, Ayurveda, and environmental conservation, as their foundational concepts will already be covered in earlier classes. This elective aims to provide an in-depth exploration of Indian disciplines for interested students while ensuring that those not opting for the course continue to gain exposure to IKS through the regular curriculum. The approach encourages creative engagement and advanced learning, fostering a deeper appreciation of India's intellectual and cultural heritage.

EXAMPLES OF STEM PRINCIPLES IN ANCIENT INDIAN KNOWLEDGE: RELEVANCE TO THE CURRENT SCENARIO

1. **Mathematics (Aryabhata, Vedic Mathematics):** The mathematical principles developed by Aryabhata, such as the concept of zero and methods for solving equations, laid the foundation for modern mathematics, and continue to be relevant today. In the current STEM education landscape, these ancient principles are still applicable in various fields, such as computer science, engineering, and data analytics. Aryabhata's work, which included an approximation of pi, is crucial in the development of algorithms and

computational methods that drive technologies used today in areas like artificial intelligence and robotics. The techniques found in Vedic Mathematics are also gaining recognition in modern classrooms for their effectiveness in fostering mental math skills and problem-solving abilities, which are essential in STEM fields.

2. **Astronomy (Panini, Lagadha's Vedanga Jyotisha):** The contributions of ancient Indian scholars like Panini and Lagadha in astronomy are still relevant in contemporary space exploration and scientific research. Lagadha's *Vedanga Jyotisha* provided early methods for astronomical calculations, which have inspired modern-day astronomical models and satellite technologies. Today, space agencies like NASA and ISRO (Indian Space Research Organisation) continue to build on these principles with advanced satellite technologies and space missions, such as the Mars Orbiter Mission (Mangalyaan). By integrating ancient knowledge with modern STEM principles, we are better able to explore and understand the universe, providing a foundation for innovations in space science, data analysis, and global positioning systems (GPS).

3. **Medicine and Ecology (Charaka, Sushruta, Traditional Water Management Systems):** Ancient Indian medical texts like the *Charaka Samhita* and *Sushruta Samhita* provide insight into the holistic approach to health and medicine, integrating science with environmental consciousness. In the current context, this ancient knowledge aligns with modern trends in integrative medicine, sustainable healthcare, and eco-friendly practices. The *Sushruta Samhita*'s understanding of surgical procedures and use of natural remedies parallels advancements in medical science, especially in areas like regenerative medicine and biotechnology. Moreover, traditional water management systems, developed to deal with India's diverse climates, are increasingly being integrated into modern engineering practices to tackle current water scarcity issues. The sustainable design and ecological balance in these systems, which include rainwater harvesting, well systems, and canal irrigation, are seen as innovative solutions in today's world, especially in the face of climate change and growing urbanization. This convergence of ancient wisdom with current STEM solutions highlights the importance of sustainability in modern engineering and environmental science.

SYNERGIZING STEM AND IKS IN EDUCATION

Integrating STEM (Science, Technology, Engineering, and Mathematics) with the Indian Knowledge System (IKS) offers a transformative approach to education that harmonizes traditional wisdom with modern innovation. This integration emphasizes the relevance of cultural practices while fostering problem-solving, critical thinking, and innovation among learners. By combining the structured methodologies of STEM with the rich heritage of IKS, education can be contextualized to create a more holistic and impactful learning experience.

One effective framework for integrating STEM and IKS is through inquiry-based learning (IBL), which fosters curiosity and encourages students to explore and apply knowledge. Traditional problem-solving methods, such as those found in Ayurveda and astronomy, offer rich contexts for inquiry. For example, Ayurvedic concepts from Charaka and Sushruta's texts can guide research into sustainable healthcare solutions, blending traditional diagnostic methods with modern biomedical practices. Similarly, ancient Indian astronomy, as detailed in Lagadha's *Vedanga Jyotisha*, can be explored using computational modelling to analyze celestial movements. Current programs, such as the Atal Tinkering Labs (ATL) initiative, exemplify this integration. ATL workshops have engaged students in projects like using traditional water management methods combined with Internet of Things (IoT) technology to design innovative water conservation solutions.

Interdisciplinary projects further enhance the synergy between STEM and IKS by linking STEM disciplines with cultural practices. For instance, mathematics and architecture can be integrated through the study of geometric patterns in Indian temple designs and their application in modern structural engineering. Similarly, sustainability projects can explore the impact of traditional organic farming practices, such as *panchgavya*, on soil health using STEM tools like pH sensors and spectrometry. Ecological studies can investigate traditional biodiversity conservation practices, such as sacred groves, through geographic information systems (GIS) and data analytics. These projects demonstrate how STEM and IKS can come together to address contemporary challenges while preserving cultural heritage.

Several educational programs have successfully implemented STEM-IKS integration. At the national level, initiatives like the ATL and the INSPIRE program by the Department of Science and Technology (DST) in India have made significant strides. ATL workshops have facilitated

innovative thinking while respecting traditional knowledge, with students working on projects that combine traditional irrigation methods with modern IoT solutions. The INSPIRE program supports research-based student projects that connect traditional herbal medicines with molecular biology, fostering both cultural awareness and innovation. At the regional level, schools in Gujarat and Maharashtra have incorporated Vedic Mathematics into STEM curricula to enhance computational skills and highlight India's ancient mathematical contributions. Similarly, programs in Rajasthan have revitalized traditional water harvesting methods, blending them with hydrological studies and engineering tools to combat water scarcity.

Globally, the integration of indigenous knowledge with STEM provides valuable insights and parallels to India's STEM-IKS initiatives. For example, Australia has integrated Indigenous ecological practices with STEM subjects, such as analyzing bushfire resistance through traditional fire management techniques. UNESCO's Local and Indigenous Knowledge Systems (LINKS) program supports education systems in incorporating local knowledge into STEM curricula, creating culturally relevant and globally competitive frameworks.

The importance of such integration is also underscored in recent policy and research documents. NEP 2020 emphasizes the need for experiential learning models that connect IKS with STEM to promote holistic development. A 2022 OECD report demonstrated that culturally inclusive STEM education improves student engagement by 30%. Similarly, UNESCO's LINKS framework (2023) highlights how indigenous knowledge enhances STEM education outcomes. Research by Ortiz-Revilla et al. (2019) underscores the significance of integrating cultural contexts into STEM education for creating globally competitive yet culturally rooted learning environments.

In conclusion, the integration of STEM and IKS is a promising model for education that bridges the gap between ancient wisdom and contemporary science. By adopting inquiry-based approaches and interdisciplinary projects rooted in traditional knowledge, educators can create learning environments that not only address real-world challenges but also instill cultural pride and innovation. Such efforts will contribute to building a more inclusive, contextually relevant, and globally competitive education system.

Table-2: Global and Indian Examples of STEM Integration with Traditional and Indigenous Knowledge:

Project/Initiative	Country/ Region	Vision/Objective	Example Activities/Outcomes
Atal Tinkering Labs (ATL)	India	Foster innovation and creativity in students by integrating STEM with hands-on learning.	Students developing solutions for water conservation using local and modern technologies.
Rural STEM Labs by Vigyan Prasar	India	Promote STEM education in rural areas with local relevance and traditional knowledge integration.	Workshops on sustainable farming techniques combining scientific and traditional practices.
Indigenous Knowledge in STEM Education	India	Integrate ancient Indian knowledge like Vedic mathematics and Ayurveda into modern STEM curricula.	Using Vedic mathematics for computational thinking and Ayurvedic principles for bio-based innovations.
EcoLEARN Project	Finland	Blend local ecological knowledge with modern STEM methodologies for sustainability education.	Teaching forest management using traditional Finnish practices and modern GIS tools.
Hawaii STEM Ecosystem	USA	Integrate Hawaiian traditional knowledge with STEM for community-based environmental conservation.	Monitoring coral reefs using modern tools while incorporating indigenous marine conservation practices.
STEAM (with Arts and Indigenous Knowledge)	South Africa	Enhance STEM learning with cultural and artistic perspectives rooted in indigenous traditions.	Projects combining African weaving techniques with geometry and engineering concepts.

		Utilize traditional agricultural knowledge to enhance STEM education through experiential learning.	Students working on hydroponics projects while analyzing Native American companion planting methods.
Garden-Based Learning in STEM	USA	Utilize traditional agricultural knowledge to enhance STEM education through experiential learning.	Students working on hydroponics projects while analyzing Native American companion planting methods.
Traditional Medicine and Modern Pharmacology	China	Link traditional Chinese medicine practices with biomedical research.	Analysis of herbal remedies through modern biochemistry to address contemporary health challenges.
TEK (Traditional Ecological Knowledge) in STEM	Canada	Foster integration of First Nations' ecological knowledge with STEM for environmental problem-solving.	Community-based projects addressing water quality using indigenous ecological methods and modern testing.
Maori STEM Initiatives	New Zealand	Incorporate Maori cultural practices and worldviews into STEM learning frameworks.	Projects studying geothermal energy through traditional Maori ecological knowledge and STEM tools.
Next Generation Science Standards (NGSS)	USA	Promote STEM education through inquiry-based and interdisciplinary learning approaches.	Development of projects integrating environmental science and indigenous ecological practices in the classroom.
Arctic STEM Education Initiative	Arctic Nations	Combine STEM and indigenous knowledge to address climate change in the Arctic.	Collaborative projects monitoring ice melt with STEM sensors and Inuit ecological knowledge.
Cultural Astronomy Program	United Kingdom	Study historical and indigenous astronomy in the context of modern	Workshops on Stonehenge and its astronomical alignment, linked with modern STEM research.

		astrophysics and STEM education.	
Indigenous Knowledge Integration in STEM	Philippines	Combine STEM with local knowledge for disaster preparedness and resilience.	Early warning systems for floods designed using indigenous weather prediction methods and STEM tools.
UNESCO Local and Indigenous Knowledge Systems (LINKS)	Global	Promote integration of local and indigenous knowledge with STEM for sustainable development.	Projects on climate adaptation strategies informed by traditional ecological practices and modern science.
Ganga River STEM Project	India	Combine STEM education with local cultural and ecological practices for river conservation.	Students analyzing water quality of the Ganga using traditional methods and modern technologies.
Solar Innovations for Rural India	India	Leverage STEM to create sustainable solar solutions incorporating local knowledge systems.	Developing solar-powered water pumps inspired by traditional irrigation systems.
Eco-Schools International Program	Global	Combine sustainability education with STEM and traditional knowledge.	Biodiversity projects that incorporate local cultural knowledge and STEM analysis in over 70 participating countries.

TEACHER EDUCATION REDESIGN

Teacher education is a formalized process through which individuals acquire the knowledge, skills, and competencies necessary to become effective educators. It includes pre-service teacher education, designed to prepare individuals for teaching roles before they enter the classroom, and

in-service teacher education, which focuses on ongoing professional development and support for practicing teachers. Teacher education programs typically combine theoretical coursework, practical teaching experiences, and rigorous assessments to ensure that educators are equipped to meet the diverse needs of students in various educational settings. **Dr. Dibyendu Bhattacharyya, in his qualitative analysis titled** *Towards a New Model of Pre-Service & In-Service Teacher Education*, **highlights the critical need for innovative frameworks that address both the structural and pedagogical aspects of teacher training programs (Bhattacharyya, 2024).**

The field of teacher education is at the crossroads of evolving educational paradigms, emerging technologies, and the ever-changing needs of learners. As the educational landscape grows more dynamic, there is an urgent need to reassess and reframe existing models of pre-service and in-service teacher education to align with the demands of the 21st century. Recognizing this, the National Education Policy (NEP) 2020 emphasizes teacher education as a critical factor in elevating the quality of education. The term "Teacher Education" is mentioned 36 times in the policy, highlighting its pivotal role and advocating for transformative measures to standardize and enhance its quality.

NEP 2020 outlines several strategies to elevate teacher education, including the integration of multidisciplinary approaches, fostering rigorous training, embedding Indian values and cultural heritage, and leveraging technology for continuous professional development. The policy underscores the need for educators to balance global competencies with local relevance, particularly by incorporating Indian Knowledge Systems (IKS) into teacher education. This integration aims to foster a culturally responsive pedagogy that reflects India's rich traditions and diverse heritage, enabling educators to connect deeply with students from various cultural backgrounds.

NEP 2020 emphasizes the importance of STEM education in teacher training, recognizing its role in preparing students for the challenges of a technology-driven world. Teacher education programs are encouraged to incorporate interdisciplinary approaches to STEM, combining scientific inquiry with creativity and problem-solving. This focus aims to empower educators to inspire students, bridge gender and regional disparities in STEM fields, and foster a culture of innovation and critical thinking.

To achieve these goals, the policy proposes the implementation of a 4-year integrated B.Ed. program as the minimum qualification for school teachers by 2030. This program blends subject specialization with pedagogical training, emphasizing Indian traditions and values. NEP 2020 also advocates for standardized admission processes, managed by the National Testing Agency (NTA), to ensure quality and inclusivity in teacher education programs. Furthermore, it promotes collaborations between teacher education institutions and schools to provide aspiring teachers with hands-on training and community engagement opportunities.

In-service teacher education is set to be strengthened through digital platforms like SWAYAM and DIKSHA, enabling large-scale and standardized professional development. The establishment of a National Mission for Mentoring, involving senior educators, will provide professional support to enhance teaching quality and ensure sustained improvement in standards.

Teacher education must evolve to meet the complex demands of modern education. By emphasizing indigenous knowledge systems and STEM education, NEP 2020 presents a vision that integrates cultural pride with scientific excellence, ensuring educators are well-prepared to inspire and equip future generations. These reforms aim to establish a robust and dynamic teacher education system that contributes significantly to India's educational progress.

ROLE OF EDUCATIONAL TECHNOLOGY IN SCALING STEM-IKS INTEGRATION

Educational technology plays a pivotal role in integrating STEM (Science, Technology, Engineering, and Mathematics) with the Indian Knowledge System (IKS), offering innovative ways to bridge traditional wisdom with modern methodologies. Tools like digital repositories (e.g., the National Digital Library of India) make IKS resources accessible, while virtual reality (VR) and gamified learning create immersive experiences linking ancient practices like Vedic mathematics or sustainable water systems to STEM concepts. Platforms such as Diksha and Atal Tinkering Labs integrate IKS into their modules, encouraging students to explore interdisciplinary applications, such as combining robotics with traditional agricultural methods. AI and machine learning further enhance this integration by contextualizing ancient knowledge for contemporary STEM challenges, promoting culturally relevant and globally competitive education.

Current initiatives highlight the growing synergy between EdTech and STEM-IKS integration. Programs like NCERT's digital curriculum incorporate IKS elements, while ISRO's outreach links

traditional astronomy to cutting-edge space science. Schools adopting project-based learning use technology to recreate traditional Indian systems, fostering innovation while respecting heritage. Despite challenges like limited resources and teacher training gaps, these examples demonstrate the immense potential of educational technology to scale STEM-IKS integration, making education more interdisciplinary, culturally grounded, and future-ready.

The transdisciplinary role of technology in STEM education integrates scientific inquiry, engineering design, mathematical modelling, and computational thinking to create a cohesive and interconnected learning experience. This perspective moves beyond traditional classifications, blending technology's instructional, computational, and engineering roles into a holistic framework that mirrors the complexity of real-life contexts. Technology acts as a semiotic mediator, facilitating natural interconnectedness among disciplines and fostering 21st-century skills like critical thinking and problem-solving. Researchers like Ellis et al. (2020) emphasize that technology's role should not only address the procedural aspects of teaching—planning, implementation, and evaluation—but also ethical and expertise-driven dimensions, ensuring equity and adaptability to students' diverse needs.

In practice, this means leveraging technology for collaborative learning, digital resource creation, and contextually relevant problem-solving while addressing challenges like ethical use and technological disruptions. Effective planning involves designing technology-rich environments, while implementation requires adaptability and feedback-oriented strategies. Evaluation incorporates digital portfolios, rubrics, and innovative assessment methods. Together, these dimensions establish technology as an essential element in transdisciplinary STEM education, ensuring relevance, engagement, and the development of globally competitive skills.

Table-3: Examples of State and Institutional Initiatives Supporting IKS in Education.

Initiative	Description	Focus Areas
Indian Knowledge System (IKS) Division, AICTE	Promotes IKS integration in education through funding, research	Mathematics, astronomy, Ayurveda, agricultural practices

	projects, and curriculum development.	
National Education Policy (NEP) 2020	Recommends incorporating IKS in curricula, fostering research, and promoting local language use for knowledge dissemination.	Arts, crafts, sciences, and indigenous knowledge systems
SCERTs and NCERT Initiatives	Develops textbooks and teacher training programs integrating local cultural heritage and traditional ecological knowledge.	Cultural heritage, ecological knowledge
IIT Gandhinagar	Offers courses and workshops on IKS topics and supports research on traditional knowledge applications in modern contexts.	Ancient water management, architecture, Vedic mathematics
Rashtriya Uchchatar Shiksha Abhiyan (RUSA)	Encourages interdisciplinary programs in higher education institutions to include IKS in curricula and research.	Traditional knowledge systems in arts, sciences, and engineering
Kerala's 'Punarjani' Project	Revives traditional knowledge in educational programs, teaching sustainability and biodiversity conservation.	Medicinal knowledge, agricultural practices
Banaras Hindu University (BHU)	Established centers for IKS studies focusing on Ayurveda, Sanskrit, and Indian classical arts, offering courses and research.	Ayurveda, Sanskrit literature, classical arts
Atal Tinkering Labs (ATL)	Promotes integrating traditional knowledge with modern technology for innovative sustainable solutions.	STEM education with IKS integration

| Chhattisgarh's Tribal Education Program | Includes tribal communities' traditional knowledge in school education to highlight resource management and cultural heritage. | Folk medicine, cultural heritage, natural resource management |

OPPORTUNITIES AND CHALLENGES

Table-4: Opportunities aligned to Teacher Education for Integrating STEM-IKS

Opportunity	Details in Teacher Education	Examples in Teacher Education	Research References
Enhanced Global Relevance through Culturally Contextualized STEM Learning	Preparing teachers to integrate IKS into STEM education makes learning culturally relevant and globally competitive.	- Teacher training modules on incorporating local ecological knowledge into environmental science lessons (e.g., traditional rainwater harvesting methods). - Workshops on indigenous mathematical practices, such as Vedic mathematics.	UNESCO (2020) on indigenous knowledge in education; Honey et al. (2014) on cultural integration in STEM.
Fostering Innovation by Blending Ancient Methods with Modern Tools	Training teachers to merge traditional practices with contemporary technology fosters creativity and innovation in classrooms.	- Professional development programs on using ancient dyeing techniques integrated with chemistry lessons and modern textile innovations.	Sivaraj et al. (2019) on the role of innovation in STEM; Ellis et al. (2020) on transdisciplinary technology in education.

		- Training for teachers on applying AI tools to interpret historical astronomical data.	
Meeting the Vision of NEP 2020 for a Holistic Educational Framework	Equipping teachers with skills to implement NEP's interdisciplinary and value-based curriculum effectively.	- Teacher education programs offering courses on integrating yoga and mindfulness into science and health curriculums. - Creation of interdisciplinary projects such as combining traditional medicine with modern biology.	NEP 2020 policy document; Snyder (2018) on holistic education in teacher preparation.
Promoting Environmental Sustainability through Indigenous Knowledge	Training teachers to include IKS for sustainable practices and conservation-focused STEM lessons.	- Field-based teacher education workshops on topics like the use of sacred groves in biodiversity conservation. - Lesson plan development using local IKS solutions for climate change adaptation.	Gupta (2021) on IKS in environmental sustainability; NCERT (2022) on eco-centric education.
Encouraging Problem-Solving with	Empowering teachers to use IKS as a foundation for real-world problem-	- Developing inquiry-based activities in teacher training such as traditional	Fullan (2020) on problem-solving in education; NEP 2020 on interdisciplinarity.

Interdisciplinary Insights	solving through an interdisciplinary lens.	irrigation systems applied in modern hydrology lessons. - Case studies for teacher trainees on ancient Indian contributions to astronomy.	
Boosting Equity and Inclusivity in Education	Including IKS in teacher education programs ensures representation of diverse cultural knowledge systems.	- Organizing collaborative sessions where teacher trainees learn from local artisans and IKS practitioners. - Designing projects to document regional indigenous knowledge and its STEM applications.	UNESCO (2021) on equity in education; NCERT (2022) on inclusivity in IKS integration.
Enhancing Teacher Creativity through Experiential Learning	Offering hands-on learning experiences that integrate IKS into STEM fosters creative teaching strategies.	- Live demonstrations for teachers on creating low-cost teaching aids inspired by IKS principles. - Collaborative teacher training projects involving role-play and simulations based on traditional STEM-related stories.	Honey et al. (2014) on experiential learning; Sivaraj et al. (2019) on creativity in teacher education.

Table-5: Challenges aligned to Teacher Education for Integrating STEM-IKS:

Challenge	Details in Teacher Education	Examples in Teacher Education	Research References
Resistance to Change in Teaching Practices	Teachers may resist integrating IKS due to comfort with conventional teaching methods and a lack of confidence in new approaches.	- Conduct hands-on workshops to introduce STEM-IKS strategies gradually. - Peer mentoring programs where experienced educators demonstrate IKS integration.	Fullan (2020) on resistance to change in education; NEP 2020 on the need for innovation in teaching.
Limited Inclusion in Teacher Training Curricula	Absence of IKS topics in pre-service and in-service teacher training programs creates a knowledge gap.	- Develop teacher training curricula that incorporate IKS principles, aligned with STEM objectives. - Offer online certification courses for teachers on STEM-IKS integration.	NCERT (2022) training reports; UNESCO (2021) on the inclusion of indigenous knowledge in education frameworks.
Lack of Contextualized Teaching Materials	Shortage of textbooks, digital resources, and TLM that blend STEM with IKS hinders effective teaching practices.	- Collaborative projects between educators and local IKS practitioners to create contextualized learning materials. - Encourage student	Honey et al. (2014) on technology-enhanced learning; NEP 2020 on creating regional-specific content.

		teachers to develop STEM-IKS projects as part of training.	
Assessing Learning Outcomes in STEM-IKS	Developing assessment tools that capture interdisciplinary learning and the cultural context of IKS is challenging.	- Use rubrics for project-based learning that measure both STEM skills and understanding of IKS principles. - Integrate portfolios and self-assessment tools in teacher training.	Snyder (2018) on holistic assessments; NCERT (2023) on evaluating interdisciplinary teaching outcomes.
Lack of Research on Effective Practices	Limited empirical studies on integrating STEM-IKS in classrooms and its impact on teacher preparedness and student outcomes.	- Encourage action research among teacher trainees and faculty on STEM-IKS implementation. - Collaborate with universities to generate field-based studies.	Sivaraj et al. (2019) on research gaps in STEM education; NEP 2020 encouraging research-based practices in education.
Technological Barriers in Rural Areas	Insufficient access to technology in rural teacher education institutions makes STEM-IKS integration harder to implement.	- Provide low-cost tech solutions (e.g., mobile apps, offline learning platforms) to teacher training colleges in underserved areas. - Organize tech-oriented teacher	Honey et al. (2014) on technology equity; UNESCO (2021) on digital inclusion in education.

		training programs for rural educators.	
Ethical and Cultural Sensitivities	Teachers may struggle to respect cultural diversity while integrating IKS without misrepresenting or oversimplifying traditional knowledge.	- Include cultural sensitivity training as part of teacher education. - Invite local IKS experts to co-develop teacher training sessions.	UNESCO (2021) on respecting indigenous cultures; NEP 2020 on inclusive and culturally sensitive education.
Overemphasis on STEM Disciplines	Overfocusing on STEM could marginalize the contributions of other subjects in holistic IKS-based education.	- Promote interdisciplinary lesson plans that connect STEM-IKS with humanities and arts during teacher training.	Snyder (2018) on interdisciplinary education; NEP 2020 advocating STEAM (adding Arts to STEM).
Time Constraints in Teacher Training	Comprehensive integration of STEM-IKS may require additional time, which is often unavailable in rigid teacher education schedules.	- Design modular or microlearning courses that allow for flexible learning of STEM-IKS concepts.	NCERT (2022) on time limitations in teacher training; Sivaraj et al. (2019) on modular learning in STEM education.

CONCLUSION

The integration of STEM education with the Indian Knowledge System (IKS) holds significant potential to revolutionize teacher education and the broader educational landscape. As highlighted in the analysis, teacher education programs must evolve to meet the demands of the 21st century, aligning with the National Education Policy (NEP) 2020's vision for interdisciplinary, culturally

relevant, and globally competitive education. By embedding IKS into STEM education, teacher training can foster innovative pedagogical strategies that bridge ancient wisdom with modern methodologies, promoting creativity, critical thinking, and problem-solving skills in classrooms.

Educational technology emerges as a crucial enabler in scaling STEM-IKS integration, offering tools such as virtual reality, gamified learning, and AI to contextualize traditional knowledge for contemporary challenges. Initiatives like Atal Tinkering Labs, NCERT's curriculum reforms, and institutional efforts by AICTE and IITs demonstrate promising models of collaboration and implementation. These efforts underscore the importance of transdisciplinary approaches, where technology facilitates interconnected learning experiences that mirror real-world complexities.

However, challenges such as resistance to change, gaps in teacher training curricula, and the scarcity of contextualized teaching materials must be addressed to realize the transformative potential of STEM-IKS integration. Tailored professional development programs, peer mentoring, and collaborative projects with local artisans and IKS practitioners can help educators build confidence and competency in this innovative teaching paradigm.

In conclusion, the redesign of teacher education to integrate STEM with IKS is not just an opportunity but a necessity to prepare future educators for a dynamic, technology-driven world while preserving cultural heritage. By embracing the NEP 2020's holistic framework, fostering equity and inclusivity, and leveraging the synergies of technology and tradition, India can create a robust, future-ready education system that equips students to navigate the complexities of the globalized world while staying rooted in their cultural identity.

RECOMMENDATIONS

1. **Enhancing Teacher Competencies through Professional Development**

   - Design and implement targeted training programs to equip teachers with the skills to integrate STEM and IKS effectively.

   - Organize workshops, online courses, and mentorship programs focusing on innovative teaching methods such as experiential learning and gamification with IKS components.

- Provide hands-on training for developing interdisciplinary teaching-learning materials (TLMs) aligned with STEM and IKS.

2. **Promoting Research on STEM-IKS Integration**

- Encourage academic institutions and researchers to conduct pilot studies and longitudinal research on STEM-IKS frameworks.

- Investigate the impact of STEM-IKS integration on students' learning outcomes, critical thinking, and cultural awareness.

- Collaborate with global experts to adapt best practices in STEM-IKS for the Indian context, ensuring scalability.

3. **Policy-Level Support for Curriculum and Resource Development**

- Advocate for curriculum reforms aligned with NEP 2020 to incorporate STEM-IKS frameworks across educational levels.

- Secure adequate funding for teacher training, curriculum redesign, and the development of STEM-IKS-aligned resources.

- Promote partnerships with private and non-profit sectors to mobilize resources for underserved schools.

4. **Collaborative Implementation Models**

- Foster collaboration among educators, policymakers, researchers, and community leaders to co-develop scalable STEM-IKS integration models.

- Pilot programs in diverse educational settings, including urban, rural, and tribal schools, to evaluate and refine implementation strategies.

- Develop open-access platforms for sharing best practices, lesson plans, and TLMs to support nationwide adoption.

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YOGA AND MEDITATION AS TRADITIONAL PRACTICES FOR PHYSICAL HEALTH AND MENTAL WELL-BEING: EXPLORING EFFECTIVE INTEGRATION WITHIN THE SCHOOL CURRICULUM UNDER THE INDIAN KNOWLEDGE SYSTEM

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ABSTRACT

The growing concerns related to students' physical health, emotional imbalance, stress, anxiety, and declining attention span have intensified the need for holistic approaches in school education. Within the framework of the Indian Knowledge System (IKS), yoga and meditation have long been recognized as effective practices for maintaining physical health, mental well-being, and overall personality development. Rooted in ancient Indian philosophy, these practices emphasize harmony of body, mind, and spirit, aligning closely with contemporary educational goals of holistic development. This paper explores yoga and meditation as traditional knowledge practices and examines their relevance in addressing modern-day challenges faced by school-going children. It further analyzes policy perspectives, especially in light of the National Education Policy (NEP) 2020, and proposes practical strategies for the effective integration of yoga and meditation into the school curriculum. The paper argues that a structured, age-appropriate, and experiential incorporation of these practices can significantly contribute to nurturing resilient, mindful, and healthy learners while preserving India's rich cultural and educational heritage.

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INTRODUCTION

Education in the twenty-first century is increasingly expected to move beyond academic achievement and focus on the holistic development of learners. Rising levels of stress, behavioral issues, lifestyle-related health problems, and emotional disturbances among school children have drawn attention to the limitations of content-heavy and examination-oriented education systems. In this context, traditional knowledge systems offer valuable insights and practices that can enrich modern schooling.

The Indian Knowledge System (IKS) represents a vast repository of philosophical, scientific, and pedagogical traditions developed over thousands of years. Yoga and meditation occupy a central place within this system, offering practical methods for cultivating physical health, mental clarity, emotional balance, and ethical living. These practices were traditionally integrated into education through the Gurukul system, where learning was experiential, value-oriented, and holistic.

The contemporary relevance of yoga and meditation has gained global recognition, with increasing scientific evidence supporting their benefits for physical fitness, stress management, emotional regulation, and cognitive functioning. This paper seeks to explore how yoga and meditation, as components of IKS, can be effectively integrated into the school curriculum to promote physical health and mental well-being among students.

OBJECTIVES OF THE PAPER

1. To examine yoga and meditation as integral components of the Indian Knowledge System and their role in promoting physical health and mental well-being among school students.
2. To explore the relevance of yoga and meditation in addressing contemporary physical, emotional, and psychological challenges faced by learners in school education.
3. To analyze the policy perspective, particularly the National Education Policy 2020, in supporting the integration of yoga and meditation within the school curriculum.
4. To suggest practical and pedagogical strategies for the effective and age-appropriate integration of yoga and meditation into the school curriculum under the framework of Indian Knowledge System.

INDIAN KNOWLEDGE SYSTEM AND HOLISTIC EDUCATION

The Indian Knowledge System is grounded in the principle of holistic development, where education is viewed as a process of self-realization and character formation rather than mere accumulation of information. Ancient Indian texts such as the Vedas, Upanishads, Bhagavad Gita, and Yogic literature emphasize the balanced development of the body (sharira), mind (manas), intellect (buddhi), and spirit (atma).

Education within IKS aimed at nurturing disciplined, self-aware, socially responsible individuals. Physical health, mental stability, ethical conduct, and spiritual awareness were considered interdependent. Yoga and meditation were not separate activities but integral components of daily life and learning.

In contrast, modern education systems often compartmentalize learning and prioritize cognitive outcomes, sometimes neglecting emotional and physical well-being. Integrating IKS-based practices like yoga and meditation can help bridge this gap and restore balance in school education.

YOGA AS A TRADITIONAL PRACTICE FOR PHYSICAL AND MENTAL HEALTH

Yoga, derived from the Sanskrit root *yuj* meaning "to unite," is a comprehensive system aimed at harmonizing body, mind, and consciousness. Classical yoga, as systematized by Patanjali in the *Yoga Sutras*, outlines the eightfold path (Ashtanga Yoga), which includes ethical disciplines, physical postures, breath control, concentration, and meditation.

Physical Benefits of Yoga for School Children

Regular practice of yogic asanas contributes to improved flexibility, strength, and posture.

1. Yoga improves muscular strength and flexibility, contributing to better physical endurance and injury prevention among school children.
2. Regular practice enhances postural alignment, which is particularly important in addressing problems arising from prolonged sitting, screen use, and heavy school bags.
3. Yogic practices support respiratory efficiency by strengthening lung capacity and improving breathing patterns through pranayama.

4. Yoga contributes to better cardiovascular functioning by promoting circulation and regulating heart rate.

5. It strengthens the immune system, making children more resilient to common illnesses and infections.

6. Yoga supports healthy growth and development by regulating hormonal balance and metabolic processes.

7. Practices such as relaxation and controlled breathing help in reducing physical fatigue and restoring energy levels.

8. Yoga aids in the development of body awareness and coordination, improving balance and motor skills.

For school-going children, yoga provides a non-competitive and inclusive form of physical activity that accommodates diverse abilities and needs.

Psychological and Cognitive Benefits

Yoga practices such as pranayama and relaxation techniques help in reducing stress and anxiety

- Yoga promotes mental calmness and emotional stability, helping students cope with academic pressure and social challenges.
- Regular yoga practice reduces stress, anxiety, and tension, contributing to improved mental health and well-being.
- Yoga enhances self-discipline and self-regulation, which are essential for effective learning and classroom behaviour.
- It improves concentration, memory, and cognitive processing, thereby supporting academic achievement.
- Yoga fosters positive self-concept and self-esteem, encouraging confidence and emotional security in learners.
- Through mindful movement and breath awareness, yoga develops emotional intelligence, including awareness of one's own emotions and sensitivity towards others.
- Yoga helps in managing behavioural issues such as hyperactivity, restlessness, and impulsivity, particularly among younger children.

- It encourages inner balance and resilience, enabling students to adapt positively to change and adversity.
- Yoga nurtures a sense of well-being and contentment, reducing negative emotional states such as frustration and anger.
- By integrating ethical principles such as discipline and balance, yoga aligns with value-based education emphasized in the Indian Knowledge System.

These benefits are particularly relevant in today's fast-paced academic environment, where students often face pressure to perform.

MEDITATION AND MENTAL WELL-BEING

Meditation is a core component of yogic practice and Indian philosophical traditions. It involves training the mind to attain calmness, clarity, and focused awareness. Practices such as mindfulness, dhyana, and mantra meditation have been integral to Indian educational thought.

Role of Meditation in School Education

1. Meditation helps in developing self-awareness and introspection among students, enabling them to understand their thoughts, emotions, and behavioural patterns more clearly.
2. Regular meditation practice supports emotional regulation, helping learners manage stress, frustration, fear, and academic pressure in a balanced manner.
3. Meditation enhances attention span and concentration, which positively influences classroom engagement, listening skills, and learning outcomes.
4. Through mindfulness practices, meditation cultivates present-moment awareness, reducing distractibility and improving students' ability to remain focused during academic tasks.
5. Meditation contributes to the development of empathy, compassion, and prosocial behaviour, thereby promoting a positive and inclusive school climate.
6. By fostering inner calmness, meditation aids in reducing impulsive behaviour and aggression, supporting better discipline and self-control among students.
7. Meditation strengthens resilience and coping skills, enabling students to respond constructively to personal, social, and academic challenges.

8. It supports cognitive flexibility and creativity, allowing learners to approach problems with openness and innovative thinking.

9. Meditation encourages ethical sensitivity and value-based thinking, resonating with the moral and philosophical dimensions of the Indian Knowledge System.

10. Regular practice of meditation can improve sleep quality and overall mental balance, which indirectly supports physical health and academic performance.

POLICY PERSPECTIVE: NEP 2020 AND IKS

The National Education Policy 2020 strongly advocates the integration of Indian Knowledge Systems into school and higher education. It emphasizes holistic development, well-being, and value-based education. Yoga has been explicitly recognized as a means to promote health, discipline, and emotional balance among students. NEP 2020 encourages:

- Incorporation of yoga and mindfulness practices in the curriculum
- Experiential and activity-based learning
- Teacher preparation for holistic and inclusive education

This policy framework provides an enabling environment for systematically integrating yoga and meditation into school education.

STRATEGIES FOR EFFECTIVE INTEGRATION INTO SCHOOL CURRICULUM

For meaningful integration of yoga and meditation under IKS, a thoughtful and structured approach is required.

Curriculum Design

- Yoga and meditation can be integrated as part of Physical Education, Health Education, or Life Skills Education.
- Age-appropriate practices should be designed for primary, upper primary, and secondary levels.
- Emphasis should be on experiential learning rather than theoretical instruction.

Teacher Preparation and Capacity Building

Teachers play a crucial role in implementation. Therefore:

- Pre-service and in-service teacher education programs should include training in basic yoga and meditation practices.
- Teachers should understand the philosophical foundations of these practices within IKS.
- A non-dogmatic, inclusive, and secular approach must be maintained.

School Environment and Daily Practices

- Short yoga or meditation sessions can be incorporated into the daily school routine, such as morning assemblies or classroom transitions.
- Creating calm and supportive learning environments enhances the effectiveness of these practices.
- Parental awareness and involvement can strengthen continuity beyond school.

CHALLENGES IN INTEGRATION OF YOGA AND MEDITATION WITH SCHOOL EDUCATION

- Overloaded curriculum remains a major challenge, as schools often prioritize academic subjects, leaving limited time for holistic practices such as yoga and meditation.
- Shortage of trained and qualified instructors who understand both yogic practices and child psychology hinders effective implementation in schools.
- Lack of clarity in curriculum frameworks regarding learning outcomes, assessment methods, and progression of yoga and meditation practices across grade levels.
- Misconceptions and resistance among parents, teachers, or administrators who may associate yoga and meditation with religious or cultural bias rather than viewing them as scientific and secular practices.
- Inconsistent implementation across schools due to variations in resources, institutional priorities, and administrative support.
- Inadequate teacher preparation in pre-service and in-service teacher education programmes related to yoga, meditation, and Indian Knowledge Systems.

- Absence of monitoring and evaluation mechanism to assess the impact of yoga and meditation on students' physical health, mental well-being, and learning outcomes.

- Limited infrastructural facilities, such as suitable open spaces or calm environments, particularly in urban schools with space constraints.

- Time-bound examination-oriented education system often undervalues non-academic outcomes like emotional well-being and mindfulness.

- Lack of age-appropriate pedagogical approaches, which may lead to practices being either too complex or insufficiently engaging for certain age groups.

- Sustainability of practice is a concern, as irregular or sporadic sessions fail to produce long-term benefits.

- Insufficient awareness of scientific evidence supporting yoga and meditation, resulting in low prioritization by policymakers and school leaders.

STRATEGIES FOR EFFECTIVE INTEGRATION OF YOGA AND MEDITATION IN SCHOOL EDUCATION

Effective integration requires suitable planning at various levels including planning, administration, implementation etc.

- **Curricular Integration with Flexibility:** Yoga and meditation should be embedded within existing subjects such as Physical Education, Health Education, or Life Skills, rather than introduced as an additional burden. Flexible models may be adopted to suit different school contexts.

- **Development of Age-Appropriate Modules:** Structured and developmentally suitable yoga and meditation modules should be designed for different school stages, ensuring progression from simple movements and breathing exercises to guided mindfulness and basic meditation practices.

- **Strengthening Teacher Education and Training:** Pre-service and in-service teacher education programmes should include mandatory training in yoga and meditation, emphasizing child psychology, classroom application, and the philosophical foundations of Indian Knowledge Systems.

- **Capacity Building through Professional Collaboration:** Collaboration with certified yoga practitioners, mental health professionals, and IKS experts can enhance the quality of programme design, teacher training, and implementation.

- **Integration into Daily School Routine:** Short and regular sessions of yoga or meditation may be incorporated into daily schedules such as morning assemblies, transition periods between classes, or closing sessions to ensure continuity and habit formation.

- **Creation of Supportive School Environments:** Schools should aim to create calm, safe, and inclusive spaces that support mindfulness and reflective practices, even within limited infrastructure.

- **Awareness and Sensitization of Stakeholders:** Orientation programmes for parents, teachers, and administrators should be conducted to address misconceptions and highlight the scientific, secular, and holistic benefits of yoga and meditation.

- **Monitoring and Evaluation Mechanisms:** Simple and qualitative assessment tools such as observation checklists, reflective journals, and well-being indicators may be used to evaluate the impact of yoga and meditation practices.

- **Policy Support and Institutional Commitment:** Clear guidelines and support from educational authorities are essential to ensure uniform implementation and sustainability across schools.

- **Research-Based Practice and Continuous Improvement:** Schools and teacher education institutions should be encouraged to document practices, conduct action research, and use evidence-based findings to refine implementation strategies.

CONCLUSION

Yoga and meditation, as traditional practices rooted in the Indian Knowledge System, offer powerful tools for promoting physical health and mental well-being among school children. Their integration into the school curriculum aligns with the broader educational vision of holistic development, as emphasized in NEP 2020. By adopting a structured, inclusive, and experiential approach, schools can effectively bridge tradition and modernity, nurturing learners who are healthy, mindful, resilient, and ethically grounded. Integrating these practices is not merely an

addition to the curriculum but a transformative step towards reimagining education in harmony with India's rich intellectual heritage.

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ROLE OF INDIGENOUS KNOWLEDGE SYSTEMS (IKS) IN TEACHING COMPETENCY

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ABSTRACT

Indigenous Knowledge Systems (IKS) encompass the accumulated knowledge, skills, beliefs, and practices cultivated by indigenous communities over centuries via their engagement with cultural, social, and natural settings. In modern education, teaching competency encompasses not just academic expertise but also cultural sensitivity, inclusivity, ethical conduct, and contextual awareness. This research analyzes the significance of Indigenous Knowledge Systems in improving teaching proficiency through the promotion of culturally sensitive pedagogy, contextualized curriculum, learner-centered instruction, and community involvement. It underscores how the incorporation of IKS enhances teachers' cultural competence, instructional creativity, critical thinking, and professional ethics. The research examines the significance of teacher education in cultivating IKS-based teaching proficiency and analyzes the obstacles in incorporating indigenous knowledge into formal educational frameworks. The research concludes that integrating Indigenous Knowledge Systems into education is vital for effective, inclusive, and sustainable learning.

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INTRODUCTION

Education is a dynamic and socially integrated process that mirrors the values, knowledge frameworks, and ambitions of a society. For an extended period, formal education institutions

globally were primarily influenced by Western epistemologies, frequently disregarding or marginalizing local knowledge systems. This marginalization led to the degradation of indigenous traditions and an education system that was detached from the lived experiences of learners. In light of these constraints, a worldwide initiative has emerged to acknowledge and incorporate Indigenous Knowledge Systems (IKS) into education. The notion of teaching competency has experienced considerable evolution. Teaching ability now extends beyond mere command of subject matter or classroom management. It now includes cultural responsiveness, diversity, ethical awareness, contextual understanding, and the capacity to engage learners meaningfully. In the changing educational landscape, Indigenous Knowledge Systems are essential in rethinking and enhancing teaching competency. The incorporation of IKS into education represents not only a curricular enhancement; it signifies a fundamental transformation that aligns instruction with cultural significance, sustainability, and social equity. This essay investigates the diverse functions of Indigenous Knowledge Systems in improving teaching proficiency, analyzing their contributions to cultural competence, pedagogical efficacy, learner-centered education, critical thinking, community involvement, ethical professionalism, and sustainable development.

INDIGENOUS KNOWLEDGE SYSTEMS (IKS)

Indigenous information Systems denote the aggregate of information, practices, skills, beliefs, and values cultivated by indigenous and local groups through prolonged engagement with their social, cultural, and environmental surroundings. This information is intricately woven into daily life and is conveyed between generations via oral traditions, storytelling, observation, rituals, imitation, and engagement in communal activities. IKS encompasses various fields, including agriculture, medicine, environment, architecture, language, art, music, governance, ethics, and spirituality. It is holistic, signifying that it does not compartmentalize knowledge into strict disciplines but perceives learning as a linked process encompassing social, cultural, spiritual, and environmental factors. A salient characteristic of indigenous knowledge is its context-specific nature. In contrast to formal scientific knowledge, which aims for universal applicability, Indigenous Knowledge Systems (IKS) are grounded in specific local ecosystems and cultural contexts. This renders it exceptionally adaptable, sustainable, and pertinent to the communities that engage in it. Acknowledging this value contests the supremacy of a singular knowledge system and facilitates epistemic variety in education.

CONCEPT OF TEACHING COMPETENCY

Teaching competency is the comprehensive synthesis of professional knowledge, abilities, attitudes, and values that empower educators to design, implement, evaluate, and reflect on instruction in manners that foster effective learning. It is a multifaceted concept that develops in response to societal, cultural, and educational philosophical shifts. The principal aspects of teaching proficiency encompass: • Domain proficiency • Instructional expertise and pedagogical competency • Management of the classroom and involvement of learners • Competence in assessment and evaluation • Cultural awareness and inclusiveness • Ethical obligations and professional behavior • Practices of reflective and lifelong learning Modern education prioritizes teaching proficiency that focuses on learner-centered, inclusive, and culturally responsive methodologies. Educators are anticipated to acknowledge students as engaged contributors to the educational environment, each possessing distinct cultural insights and backgrounds.

THEORETICAL BASIS FOR INTEGRATING IKS AND TEACHING COMPETENCY

The inclusion of Indigenous Knowledge Systems into pedagogical proficiency is endorsed by several educational ideologies. The constructivist paradigm posits that learners build knowledge upon their previous experiences. Indigenous learners possess extensive cultural knowledge from their communities, hence instruction that integrates Indigenous Knowledge Systems aligns with constructivist concepts.

Culturally responsive pedagogy promotes instruction that recognizes and leverages students' cultural origins. Critical pedagogy advocates for the incorporation of Indigenous Knowledge Systems by contesting power dynamics that favor specific types of knowledge over others. Collectively, these theoretical frameworks establish a robust basis for acknowledging Indigenous Knowledge Systems as a vital element of pedagogical proficiency.

ROLE OF IKS IN DEVELOPING CULTURAL COMPETENCY

The development of cultural competence is one of the most significant contributions of Indigenous Knowledge Systems to teaching proficiency. Cultural competency denotes a teacher's capacity to comprehend, honor, and adeptly address the cultural identities of students. By engaging with

Indigenous Knowledge Systems (IKS), educators acquire understanding of indigenous perspectives, values, traditions, languages, and belief frameworks. This comprehension aids educators in circumventing cultural bias, deficit ideology, and stereotyping. Teachers perceive indigenous learners not as deficient in knowledge, but as possessors of significant cultural capital. Culturally proficient educators develop inclusive educational settings in which students feel esteemed and acknowledged. This sense of belonging augments learners' motivation, engagement, and academic achievement. Consequently, IKS is crucial in developing teaching proficiency by cultivating empathy, respect, and cultural understanding.

IKS and Contextualization of Curriculum

A significant difficulty in formal education is the disjunction between curriculum knowledge and students' real-world experiences. Indigenous Knowledge Systems facilitate the contextualization of curriculum content by educators. For instance, principles of environmental science can be imparted using indigenous methodologies concerning conservation, water management, and biodiversity. Agricultural education may encompass conventional farming practices, seed conservation strategies, and seasonal expertise. Health education can utilize traditional medical practices and preventive health strategies. When educators contextualize learning in this manner, abstract abstractions transform into tangible and significant ideas. Students are more proficient in comprehending, retaining, and using knowledge. The capacity to contextualize curriculum knowledge is a hallmark of proficient teaching capability.

Promoting Inclusive and Learner-Centered Pedagogy

Inclusive education is fundamental to teaching proficiency, and Indigenous Knowledge Systems (IKS) significantly contribute to fostering inclusion. Integrating indigenous knowledge into education affirms the experiences and insights that students provide from their homes and communities. This validation converts the classroom into a learner-centered environment where students engage actively in the development of knowledge. Students are encouraged to share their experiences, narratives, and viewpoints, so enhancing classroom discussions and collaborative learning. This learner-centered methodology enhances teachers' classroom management, communication skills, and instructional efficacy. It promotes democratic principles, mutual respect, and social cohesiveness in the classroom.

CONTRIBUTION OF IKS TO PEDAGOGICAL INNOVATION

Indigenous Knowledge Systems provide valuable pedagogical ideas that improve teaching proficiency. Conventional methods of knowledge dissemination, including storytelling, music, dance, rituals, observation, and experiential learning, offer compelling alternatives to traditional lecture-based teaching. Storytelling is a powerful educational instrument that enhances moral thinking, imagination, memory, and emotional involvement. Experiential learning by observation and engagement cultivates practical skills and profound comprehension. Acquisition of knowledge through rituals and communal activities cultivates ideals, discipline, and shared accountability. By integrating these indigenous educational approaches, educators diversify their instructional techniques and accommodate various learning styles. This educational adaptability and innovation are essential characteristics of superior teaching proficiency.

IKS and Development of Critical Thinking

Contrary to the misperception that indigenous knowledge is devoid of scientific rigor or critical analysis, Indigenous Knowledge Systems promote analytical reasoning, problem-solving, and adaptation. Indigenous groups have created advanced knowledge systems via observation, experimentation, and reflection throughout centuries. When educators incorporate Indigenous Knowledge Systems with contemporary scientific understanding, students encounter diverse viewpoints. This comparison method fosters critical analysis, inquiry, and assessment of knowledge assertions. Students understand that knowledge is fluid and contingent upon context rather than static and universal. Educators who promote critical inquiry exhibit elevated intellectual and pedagogical proficiency. They equip learners to interact critically with intricate social, environmental, and cultural issues.

Strengthening Teacher–Community Relationships

Teaching competency encompasses not only classroom instruction but also significant involvement with the community. Indigenous Knowledge Systems inherently foster collaboration between educational institutions and local populations. Educators who incorporate Indigenous Knowledge Systems frequently collaborate with

parents, elders, craftspeople, farmers, and traditional healers. This relationship enhances education by offering genuine learning opportunities and regional resources. It fosters trust and mutual respect between educational institutions and communities. Robust teacher-community interactions augment teachers' professional ability, social responsibility, and ethical awareness. They also guarantee that education stays pertinent and attuned to community requirements.

Ethical and Professional Dimensions of Teaching Competency

The incorporation of Indigenous Knowledge Systems necessitates that educators maintain elevated ethical standards. Indigenous knowledge is typically communal and intricately linked to cultural identity. Educators must honor intellectual property rights, refrain from misrepresentation, and guarantee that indigenous knowledge is neither exploited nor trivialized. By responsibly engaging with Indigenous Knowledge Systems, educators cultivate a robust sense of professional accountability and integrity. Ethical awareness is an essential element of teaching proficiency, especially in culturally varied settings.

IKS and Sustainable Development

Indigenous Knowledge Systems are closely connected to sustainable development. Conventional methods frequently prioritize ecological harmony, resource conservation, and intergenerational accountability. These principles are progressively significant in tackling global issues such as climate change, environmental degradation, and resource depletion. Educators who include Indigenous Knowledge Systems foster environmental consciousness and sustainable actions among students. This improves educators' proficiency in tackling modern global challenges and aligns education with sustainable development objectives.

ROLE OF TEACHER EDUCATION IN IKS-BASED COMPETENCY DEVELOPMENT

Teacher education is crucial for cultivating teaching proficiency rooted in Indigenous Knowledge Systems (IKS). It assists prospective educators in comprehending the importance of indigenous knowledge and its use in formal education. Integrating Indigenous Knowledge Systems into the teacher education curriculum fosters cultural awareness, sensitivity, and respect for indigenous traditions and values among educators. Teacher education programs equip educators to employ culturally responsive and experiential pedagogical techniques, including storytelling, project-

based learning, observation, and community engagement. Field trips and engagement with indigenous communities offer practical experience and ethical insight into indigenous knowledge. Reflective practices and research initiatives promoted in teacher education facilitate teachers' critical evaluation of their pedagogical methods and convictions. Consequently, teacher education equips educators to proficiently incorporate Indigenous Knowledge Systems into classroom instruction, thereby augmenting their overall teaching efficacy.

CHALLENGES IN INTEGRATING IKS INTO TEACHING COMPETENCY

Incorporating Indigenous Knowledge Systems (IKS) into pedagogical competency is crucial yet presents numerous problems. A significant difficulty is the insufficient training and understanding among educators, as several teacher education programs inadequately equip teachers to incorporate indigenous knowledge into classroom instruction. A further problem is the scant documenting of indigenous knowledge, as it is predominantly conveyed orally, complicating instructors' access to authentic and credible educational resources. Inflexible curriculum and examination-centric educational frameworks further limit educators' ability to integrate local and indigenous knowledge into their instruction. Language hurdles present challenges, as indigenous knowledge is intricately connected to local languages and dialects with which educators may be unfamiliar. The absence of adequate cultural comprehension among educators may lead to misrepresentation, oversimplification, or stereotyping of indigenous behaviours. Furthermore, insufficient institutional support, ambiguous regulatory frameworks, and social perceptions that regard indigenous knowledge as subordinate to contemporary scientific knowledge impede its reception. Ethical dilemmas about ownership, consent, and the respectful utilization of indigenous knowledge pose considerable hurdles.

EDUCATIONAL AND SOCIAL SIGNIFICANCE OF IKS IN TEACHING COMPETENCY

Indigenous Knowledge Systems (IKS) significantly contribute to educational and social frameworks by augmenting teaching proficiency. IKS assists educators in rendering learning culturally pertinent, contextualized, and significant, so enhancing student engagement and comprehension. It promotes inclusive and learner-centered pedagogy by recognizing the

knowledge students provide from their communities. IKS fosters respect for cultural diversity, safeguards indigenous heritage, and enhances teacher-community relations. It also fosters ethical pedagogical practices and promotes sustainable development and environmental consciousness. Consequently, including Indigenous Knowledge Systems into pedagogical proficiency fosters both efficient education and societal cohesion.

CONCLUSION

The significance of Indigenous Knowledge Systems in fostering teaching competency is substantial, multifaceted, and transformative. In a time of globalization and cultural variety, proficient teaching takes more than mere technical skills and topic knowledge. It necessitates cultural sensitivity, ethical accountability, contextual awareness, and receptiveness to multiple epistemologies. Indigenous Knowledge Systems offer a robust basis for cultivating these competencies. Integrating IKS into pedagogical practices enhances teachers' professional efficacy, enriches students' educational experiences, and fosters inclusive and sustainable education. Consequently, the acknowledgment and incorporation of Indigenous Knowledge Systems must be seen as a fundamental element of teaching proficiency and educator training in the modern educational context.

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A CRITICAL ANALYSIS OF MUSLIM SCHOLARS' CONTRIBUTIONS TO INDIAN KNOWLEDGE SYSTEM IN THE CONTEXT OF NEP-2020

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ABSTRACT

The study examined the contributions of Muslim Scholars to Indian Knowledge Systems (IKS) and explored their relevance for promoting inclusive, holistic, and culturally grounded education under the National Education Policy (NEP-2020). The aim of this research is to highlight how the intellectual and scientific contributions of post-independence Muslim scholars such as Maulana Abul Kalam Azad, Dr. Zakir Hussain, and APJ Abdul Kalam can inform contemporary inclusive and holistic education. The study critically examined and analyzed the contributions of Muslim scholars to the Indian Knowledge System and examined their relevance to the vision and objectives of NEP-2020. Inclusion criteria focused on Muslim Scholars in India post-1947 whose work directly impacted education, while exclusion criteria omitted writings limited to purely political or religious discourse without educational relevance. Findings indicated that Muslim Scholars have enriched IKS in the context of NEP-2020 through institutional reforms, curriculum innovation, moral and ethical education, and integration of Indian Knowledge with modern science and technology. Their contributions resonate with the NEP-2020 vision, which emphasizes multilingualism, value-based learning, experiential learning and holistic development. The study concluded that recognizing and integrating the educational philosophy and ideas of Muslim scholars can strengthen in actualizing NEP-2020's objectives, ensuring that Indian Knowledge System continue to evolve as dynamic, pluralistic, and socially responsive frameworks in contemporary education.

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INTRODUCTION

Indian Knowledge System (IKS) embody a pluralistic and composite intellectual heritage that has evolved through interaction among diverse cultural, scientific, philosophical, and educational traditions. The contemporary educational landscape in India, particularly under the National Education Policy (NEP-2020), emphasizes integration of indigenous knowledge with modern pedagogy to foster holistic, value-based, and inclusive learning environments. NEP-2020 especially calls for revitalizing the Indian Knowledge System, spanning local language, arts, sciences, ethical values, and ecological knowledge with formal and modern education to enable learners to connect knowledge to life outside the classroom and promote multidisciplinary and culturally contextually learning (NEP-2020, Government of India). Although classical IKS discourse has traditionally highlighted pre-modern Sanskritic and regional traditions, the post-independence era witnessed critical contributions by Muslim Scholars and educationists whose intellectual and institutional work helped shape modern Indian education and knowledge culture. These contributions resonate with NEP-2020's vision of inclusive, holistic education rooted in human values, ethical engagement, and scientific temperament.

One of the most influential post-independence figures was Maulana Abul Kalam Azad (1888-1958), India's first education minister. He was one of the foremost leaders of Indian freedom fighters. He was not only a political leader but also an intellectual and thinker who engaged in writing and speaking on different issues, including education. As a scholar and nation builder, Maulana Abul Kalam Azad played a pivotal role in shaping the modern Indian education system. He promoted universal primary education, teacher training, and institutional development, including the establishment of key bodies such as the University Grants Commission (UGC) and premier institutions like the Indian Institute of Technology (IITs), which became pillars for scientific and technological advancement in independent India. Maulana Abul Kalam Azad also championed education for girls and advocated a broad curriculum that encompassed arts, sciences, and moral values, emphasizing education as a tool for both individual growth and national development. His contributions are widely acknowledged as foundational in building an inclusive education system that aligns with NEP-2020 that emphasizes on equity and access to quality education for all social strata (Habib,2015).

Alongside Maulana Abul Kalam Azad, Dr. Zakir Hussain (1897-1969) former president of India emerged as a visionary educator whose work reinforced the principle that education must integrate moral, practical, and intellectual dimensions. Dr. Zakir Hussain' s advocacy of Basic Education, (Nai Talim) influenced by Gandhian pedagogy emphasized learning through craft, and experiential engagement, reflecting a holistic pedagogy that sought to integrate intellectual growth with life skills, the dignity of labour, and community participation. His leadership at institutions such as Jamia Millia Islamia and Aligarh Muslim University reflected his commitment to inclusive education that bridged traditional and modern knowledge, aligning with NEP-2020 goals of experiential learning and value-based education.

The legacy of Muslim scholars further extended into the scientific and technological domain with Dr. APJ Abdul Kalam (1931-2015) whose career as a scientist and later president of India, exemplified how Muslim scholars have embedded scientific knowledge within a broader educational philosophy that integrates curiosity, innovation, and societal development. Dr. APJ Abdul Kalam's vision of education extended beyond formal schooling to include technological empowerment, youth empowerment, skill-based learning, and innovation- driven knowledge creation (Panday,2019). He emphasized that education should motivate students to become "Job creators rather than job seekers" advocating for virtual learning environments and skills-based curricula that resonate with NEP-2020's focus on 21st- century competencies and digital learning strategies.

Academic discourse on post-independence Muslim contributions to Indian educational thoughts also underscores the value of these contributions for contemporary IKS frameworks. Scholars highlighted these Muslim intellectuals have consistently emphasized ethical dimensions of knowledge, community engagement, moral education, and social responsibility, thereby broadening the scope of knowledge and beyond mere technical proficiency to include character formation and societal transformation (Habib & Raina). This resonates with NEP-2020's broader objective of nurturing ethical and value-driven citizens. By recognizing the contributions of Maulana Abul Kalam Azad, Dr. Zakir Hussain and APJ Abdul Kalam, educational scholarship and policy can more effectively embody NEP-2020's emphasis on inclusive, multidisciplinary, and culturally grounded educational paradigms that are responsive to contemporary challenges.

OVERVIEW OF NEP-2020

The National Education Policy (NEP-2020) represented a paradigm shift in India's education system by integrating global educational practices with India's indigenous intellectual and cultural traditions. One of the distinctive features of NEP-2020 is its explicit recognition of the Indian knowledge system (IKS) as a valuable source of knowledge that can enrich contemporary education. IKS includes India's contributions to philosophy, mathematics, science, medicine, ecology, arts, ethics, and pedagogy developed through centuries of scholarly inquiry. NEP-2020 emphasized holistic development of learners by moving beyond rote memorization towards multidisciplinary and experiential learning. The policy focused on the integrated development of cognitive, emotional, physical, ethical, and creative capacities. Flexible curriculum structures, integration of arts, sports, vocational education, and value-based learning reflect the holistic ideals inherent in traditional Indian educational thoughts (NCERT, 2022). Inclusivity and equity form a central pillar of NEP-2020. The policy aims to ensure universal access to quality education, with special emphasis on marginalized groups such as socio-economically disadvantaged communities. The promotion of mother tongue or local language instruction in early schooling aligns with IKS and supports inclusive learning by respecting cultural and linguistic diversity (Government of India, 2020). NEP-2020 also recognized the transformative role of digital learning in expanding access and improving educational quality. It encourages the use of digital platforms, blended learning models, online resources and virtual laboratories. The establishment of the National Educational Technology Forum (NETF) aims to promote technology-driven, inclusive and equitable education while addressing the digital divide.

Overall, NEP-2020 envisions an education system that is holistic, inclusive, digitally empowered, and culturally rooted, blending Indian knowledge traditions with global educational practices.

METHOD AND MATERIALS

The present study adopted a qualitative historical-analytical research design to examine the contributions of Muslim Scholars such as Maulana Abul Kalam Azad, Dr. Zakir Hussain and APJ Abdul Kalam to the Indian Knowledge System. The study is grounded in interpretive and descriptive approaches, suitable for analyzing ideas, educational philosophies, and institutional contributions in a post-independence Indian context.

SOURCES OF DATA

Data for the study were collected from secondary sources including Government documents especially NEP-2020, scholarly books, peer-reviewed journal articles, biographies, speeches, and writings of the selected scholars.

Inclusion and Exclusion criteria

Inclusion criteria consist of literature focusing on post-independence Muslim Scholars such as Maulana Abul Kalam Azad, Dr. Zakir Hussain and APJ Abdul Kalam's contributions to education, knowledge system, and inclusive learning in India.

Exclusion criteria included pre-independence studies, non-academic opinion, and sources lacking scholarly credibility.

DATA ANALYSIS

The collected data were analyzed using thematic content analysis, identifying key themes such as inclusivity, holistic education, ethical values, scientific temper, and teacher education. These themes were critically mapped against the objectives and principles of NEP-2020 to draw analytical conclusions.

RESULTS

The analysis revealed that Muslim Scholars have made substantial post-independence contributions to Indian Knowledge System through institution-building, pedagogical reform, scientific temper, and equity- oriented education. Maulana Abul Kalam Azad's initiatives strengthened higher education governance and access, while Dr. Zakir Hussain advanced experiential learning and value-based learning. Dr. APJ Abdul Kalam integrated science, ethics, and innovation. These contributions closely align with NEP-2020's emphasis on holistic, inclusive, multidisciplinary and value-based education.

DISCUSSION

The present study examined the contributions of Muslim Scholars to the Indian Knowledge System in the post-independence period and analyzed their relevance for inclusive and holistic education under the National Education Policy (NEP-2020). The findings revealed that these scholars

significantly can influence educational philosophy, institutional development, pedagogy, scientific temper, and equity-oriented reforms, all of which resonate strongly with contemporary policy objectives.

Institutional development and knowledge infrastructure

One of the most significant findings is that Muslim Scholars played a foundational role in building India's post-independence educational infrastructure. Maulana Abul Kalam Azad, as the first education minister of independent India, conceptualized education as a public essential for nation building. His initiatives led to the establishment and strengthening of institutions such as University Grants Commission (UGC) Indian Institute of Technology (IITs) and national academies of culture and science (Britannica, 2023). These institutions contributed to the development of modern scientific and humanistic knowledge while remaining rooted in Indian intellectual traditions. This institutional vision aligns closely with NEP-2020 ' s emphasis on strengthening higher education institutions, promoting multidisciplinary universities, and ensuring equitable access to quality education (Ministry of Education 2020). The findings showed that Maulana Abul Kalam Azad's policy framework anticipated several principles that NEP-2020 later formalized, academic excellence, inclusivity and value-based education.

Holistic and Value-Based Education

The study found that Muslim Scholars emphasized a holistic conception of education, integrating intellectual, moral, and social development. Dr. Zakir Hussain' s advocacy of Basic Education underscored learning through productive work, community-oriented learning, and ethical values (Sharma,2014). His educational philosophy rejected rote learning and promoted experiential and learner centered education. This approach reflected NEP-2020's stress on experiential learning, competency-based education, and the integration of ethics and constitutional values into curricula (MOE,2020). The findings indicated that Dr. Zakir Hussain's ideas remain highly relevant in addressing contemporary concerns about learner disengagement and the disconnect between education and real-life context. Further, the study found that NEP-2020 reflects a strong convergence of IKS and Dr. Kalam's educational ideas. The policy emphasized holistic and multidisciplinary education, creativity, critical thinking, and experiential learning that resonates with Kalam's vision and central principles of education as well as his lifelong advocacy of science-driven development for innovation and nation building.

Integration of Scientific Temper and Indigenous Ethos

Another key finding is the successful integration of modern science with Indian ethical and cultural values by scholars such as Dr. APJ Abdul Kalam, popularly known as people's president. APJ Abdul Kalam viewed education as a powerful instrument for national transformation and individual empowerment. He believed that education should nurture not only intellectual abilities, but also moral values, creativity, problem-solving skills, technical training, and a sense of social responsibility (Singh,2017). He consistently emphasized innovation, indigenous technological developments and youth empowerment. This synthesis reflects a core objective of the Indian knowledge system as articulated in NEP-2020, which promotes blending traditional wisdom with modern scientific knowledge to foster innovation and sustainability (MoE,2020).

Inclusivity and Social Equity in Knowledge System

A critical finding of the study is that Muslim Scholars consistently foregrounded inclusivity, social justice, and democratic access to education. Their works challenged elitist and exclusionary knowledge structures by advocating education for marginalized communities, women, and linguistic minorities. Scholars such as Maulana Abul Kalam Azad and Dr. Zakir Hussain explicitly argued that education must bridge social divides rather than reinforce them (Husain,2015). The Indian knowledge system emphasized holistic learning, ethical values, community life, and harmony between the individual and society. These principles closely resonate with the educational philosophy and ideas of Dr. Zakir Hussain. He believed that education should be life-centered, work-oriented, value-based, and ensuring the dignity of labour, rather than bookish and examination-driven. However, Kalam's belief that "a developed India is one where every citizen has equal access to knowledge and opportunity", directly relate to the inclusivity that is a core pillar of NEP-2020. Because policy seeks to ensure equitable access to quality education for rural learners, socio economically disadvantage groups, women, minorities, and learners with disabilities. So, Muslim Scholars' contributions can help expand the conceptual boundaries of Indian knowledge system beyond the dominant narratives, reinforcing its plural and composite character.

POLICY IMPLICATIONS UNDER NEP-2020

The findings collectively indicated that educational ideas and practices of Muslim scholars are closely related to Indian Knowledge System in the context of NEP-2020. Their emphasis on ethical values, scientific temper, experiential learning, and inclusivity can inform curriculum design, teacher education, and institutional governance. The study showed that integrating these contributions into teacher education programs can help future educators and inclusive framework rather than a monolithic tradition. Moreover, such integration can foster social cohesion and intercultural understanding in classrooms, addressing contemporary challenges of polarization and exclusion in education (Nambissian,2019).

In Summary, the findings confirmed that Muslim Scholars have made enduring contributions to Indian knowledge system by shaping educational institutions, pedagogical philosophies, scientific education, and equity- oriented reforms in post-independence India. These contributions align strongly with NEP-2020's vision of holistic, inclusive, and multidisciplinary education. The discussion underscored that need for greater scholarly and curricular recognition of these contributions to ensure that Indian knowledge system reflect the country's composite intellectual heritage.

STRENGTHS AND LIMITATIONS

In the context of NEP-2020, the educational ideas and contributions of post-independence Muslim scholars revealed both enduring strengths and contextual limitations.

Maulana Abul Kalam Azad provided a strong inclusive foundation for Indian education. His emphasis on universal access, adult education, scientific temper, cultural pluralism, and institution-building closely aligns with NEP-2020's goals of equity, access, and quality. The establishment and strengthening of institutions such as universities, research bodies, and scientific education systems reflect his long-term vision for nation building through education. However, Maulana Azad's approach was largely policy-oriented and idealistic; limitations in administrative capacity and grassroots implementation meant that vocational integration, and outcome-based schooling— central to NEP-2020– remained underdeveloped during his time.

Dr. Zakir Hussain contributed significantly to the Idea of holistic and value-based education. His advocacy of work-centred learning, dignity of labour, moral education, and community

engagement resonates strongly with NEP-2020's experiential learning, learner centric, and holistic approach. Dr. Zakir Hussain' s vision anticipated the integration of life skills, ethics, and education for responsibility. Nevertheless, his Gandhian model faced challenges of scalability in the mass education system. Moreover, it had limited engagement with technology-driven learning, digital literacy, and interdisciplinary research, which are key pillars of NEP-2020.

Dr. A.P.J. Abdul Kalam contributed holistic, scientific and innovation-oriented dimensions of the Indian knowledge system. His focus on STEM, holistic approach, creativity, responsible citizen, indigenous technological development and youth empowerment aligns with NEP-2020's emphasis on research, innovation, and 21st-century skills. Dr. Kalam's educational philosophy highlighted the importance of character building, moral integrity, practical skills, scientific inquiry, a sense of social responsibility, and youth empowerment (Panday & Yadav, 2019).

CONCLUSION

This study has critically examined the post-independence contributions of Muslim Scholars to the Indian knowledge system (IKS) and analyzed their relevance for inclusive and holistic education in the context of the National Education Policy (NEP-2020). The analysis demonstrated that Muslim intellectuals and educationists have played a vital role in shaping India's modern educational landscape through the institution-building, pedagogical innovation, promotion of scientific temper, and commitment to social equity. The contributions of scholars such as Maulana Abul Kalam Azad, Dr. Zakir Hussain and Dr. APJ Abdul Kalam shared the vision of education as a transformative force rooted in ethical values, cultural pluralism, and national development. Their ideas and initiatives reflect a holistic understanding of knowledge that integrates intellectual, moral, social, and political dimensions that align closely with NEP-2020's emphasis on multi-disciplinary learning, experiential learning, and value-based education. From a policy perspective, the finding suggested that integrating the educational philosophies and practices of Muslim Scholars into teacher education, curriculum design, and institutional governance can meaningfully support the implementation of NEP-2020. Such integration can promote intercultural understanding, equity, and social cohesion while preparing learners to address contemporary challenges with ethical responsibility and critical insight. In conclusion, the contributions of Muslim scholars to the Indian knowledge system are highly relevant. The philosophies of Muslim Scholars regarding education are very helpful in building an inclusive, holistic, and future-oriented

education system. Their legacy offers valuable guidance for realizing NEP-2020's vision of education that is rooted in India's composite culture and responsive to global realities.

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INTEGRATION OF NEP 2020 WITH INDIA'S KNOWLEDGE HERITAGE

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ABSTRACT

Integration of Indian Knowledge heritage with NEP 2020, The Indian Knowledge Heritage (IKH) encompasses a vast area of traditional knowledge, including Philosophy, Medicine, Science, Arts and Culture accumulated over millennia in the Indian subcontinent. It represents the essence of India's intellectual heritage, reflecting a holistic approach to understanding and interacting with the world. The National Education Policy (NEP) 2020 seeks to reform and modernize India's education heritage by integrating diverse knowledge heritages, including IKH , into the curriculum. This integration aims to create a more inclusive, holistic, and flexible educational framework that respects traditional wisdom while addressing contemporary needs. The meaning of IKH denotes the traditional knowledge and practices developed in India, which encompass a wide range of disciplines and reflect the philosophical, scientific, and cultural insights of ancient Indian civilizations. Incorporating IKH into the educational framework is crucial for preserving cultural heritage, providing students with a broad and holistic perspective, and ensuring that education remains relevant to both traditional and modern contexts. Cultural relevance makes education more relevant to local contexts and traditions. To safeguard and transmit traditional knowledge and cultural practices in various fields of knowledge, fostering a comprehensive understanding of the world. Interdisciplinary approach combines various fields such as Philosophy, Science, Arts and Ethics, Physical, Mental, and Spiritual dimensions of education which reflects and preserves the cultural and philosophical heritage of India. The integration of Indian Knowledge Systems (IKS) within the National Education Policy (NEP) 2020 offers a robust framework for understanding contemporary social challenges and promoting context-specific research. Such integration fosters the preservation, revitalization, and dissemination of India's diverse indigenous knowledge traditions among key educational stakeholders, while leveraging modern technologies to enhance their relevance and application. This paper examines pathways for embedding IKS into the existing education system to address pressing challenges in India's

education sector and critically discusses the structural and operational challenges associated with implementing IKS-related policy provisions.

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INTRODUCTION

Indian Knowledge Heritage, officially revitalized as the Indian Knowledge Systems (IKS), is a vast body of intellectual, scientific, and spiritual wisdom developed over millennia in the Indian sub-continent. The Indian Knowledge heritage (IKH) is often referred to as the **"Soul of India"** because it embodies the essence of India's intellectual and cultural heritage, deeply influencing its way of life, values, and societal structures. It integrates a wide range of fields, reflecting a comprehensive worldview and a holistic approach to understanding and interacting with the world. It emphasizes a holistic worldview (Bhāratīya Drishti) that integrates the physical, intellectual, and spiritual dimensions of life. IKS is a timeless wisdom for addressing contemporary challenges such as environmental sustainability, mental health, and ethical living. With the National Education Policy (NEP) 2020 emphasizing the integration of IKS into education, its significance has been revitalized for the modern era. This paper explores the philosophical foundations, scientific achievements, and cultural contributions of the Indian Knowledge System, emphasizing its continuing relevance and global recognition in shaping a sustainable and harmonious future**. Philosophical heritages** like Vedas,Vedanta ,Upanishads, and Yoga. **Scientific Knowledge** encompasses ancient contributions to Mathematics, Astronomy and Medicine. **Cultural Knowledge** Includes Arts, Literature, and **Traditional Crafts** gives utility in Present Educational heritage. According to Vedas: Purusharthas:The four goals of life—Dharma (ethics), Artha (prosperity), Kama (desire), and Moksh(liberation). Darshanas: Six Schools of Philosophy including Nyaya (logic), Samkhya (Enumeration), and Yoga (Discipline). Guru-Shishya Parampara: A time-tested lineage of oral and experiential knowledge transmission.

By integrating IKH, the curriculum can include traditional knowledge alongside contemporary subjects, providing students with a richer and more diverse learning experience. IKH offers methods and practices that promote physical, mental, and emotional well-being, aligning with NEP 2020's emphasis on holistic development. Incorporating cultural preservation, traditional arts, crafts, and cultural practices helps preserve and promote India's cultural heritage. Global Competence with combining traditional knowledge with modern education prepares students to address global challenges while staying connected to their cultural roots. In summary, integrating IKS with NEP 2020 aims to create an educational heritage that honors traditional wisdom while adapting to contemporary needs, fostering a holistic, inclusive, and culturally relevant learning environment.

CONCEPT OF IKH (INDIAN KNOWLEDGE HERITAGE

The Indian Knowledge System (IKS) refers to the collective wisdom, traditions, and practices developed in India over thousands of years. Here are several definitions of the Indian Knowledge Heritage (IKH) from different perspectives:

From the Philosophical Spirituality Vedas Point of View: The Indian Knowledge heritage (IKH) refers to the body of wisdom and intellectual traditions developed in India over millennia, encompassing diverse fields such as philosophy, science, medicine, and arts. It integrates metaphysical concepts with practical applications to offer a holistic understanding of human existence and the natural world. The Rigveda, one of the earliest known texts, reflects the Indian quest for truth and cosmic order (Rta). The Upanishads emphasize self-realization, unity of existence, and the pursuit of knowledge. The six Darshanas, or schools of philosophy, offer diverse yet complementary perspectives: Nyaya (logic), Vaisheshika (atomism), Samkhya (enumeration), Yoga (discipline), Mimamsa (ritual interpretation), and Vedanta (metaphysics). One of the six classical schools of Indian philosophy, focusing on the study of the Vedas and Upanishads. It explores concepts like Brahman (the ultimate reality) and Atman (the self).Yoga: An ancient practice aiming for physical, mental, and spiritual well-being. It includes various forms like Hatha Yoga and Raja Yoga, and is documented in texts such as the Yoga Sutras of Patanjali.

Together, these schools highlight inquiry, rationality, and the spiritual quest. The Purusharthas-Dharma, Artha, Kama, Moksha—form the fourfold goals of life, balancing morality, prosperity,

desire, and liberation. This philosophical foundation created a culture where science, arts, and spirituality flourished without contradiction.

Ethics and Governance Dharma: The concept of duty and righteousness, which governs ethical behaviour and social responsibilities. Political Theory: Texts like the Arthashastra by Kautilya (Chanakya) offer insights into statecraft, economics, and military strategy.

From the Educational Point of View: IKH denotes the traditional educational framework of India that includes classical texts, methods, and practices developed through ancient philosophical and scientific inquiries. It represents a comprehensive approach to education that combines theoretical knowledge with practical skills, aiming for the overall development of individuals and society. Ayurveda and Yoga influenced medical systems in Greece, China, and the Arab world, with Persian translations of Charaka Samhita and Sushruta Samhita enriching Islamic medicine. Education in ancient India was imparted through Gurukuls. The educational model of Nalanda, Takshashila, and Vikramashila University inspired institutions across Asia, attracting students from China, Korea, and Central Asia. Chinese scholars like Xuanzang and Faxian documented their studies in India, spreading Buddhist and scientific knowledge back to their homelands.

From the Cultural (Arts and Literature) Point of View: The Indian Knowledge heritage embodies the cultural and intellectual heritage of India, reflecting the synthesis of various knowledge streams including ancient scriptures, rituals, arts, and traditional practices. Classical music traditions, both Carnatic and Hindustani, trace their roots to Vedic chants. It includes forms like Bharatanatyam, Kathak, and Carnatic and Hindustani music, each with a rich theoretical and practical tradition. Sanskrit, Prakrit, Tamil, and Pali produced vast bodies of literature, from grammar to poetry. Classical works such as the Mahabharata, Ramayana, continue to inspire ethical reflection, leadership values, and literary traditions and various Sanskrit plays and poems contribute significantly to the global literary canon.

From the Scientific Perspective: Indian Knowledge Heritage (IKH) encompasses the accumulated scientific knowledge of ancient India across disciplines such as astronomy, mathematics, medicine, metallurgy, and linguistics. This tradition integrates empirical observation with theoretical reasoning, contributing significantly to both traditional and modern science. Aryabhata introduced the concept of zero, calculated the value of pi, and explained planetary

motion, while Bhaskara II advanced algebra and early calculus. Astronomers like Aryabhata, Brahmagupta, and Varahamihira accurately calculated eclipses and planetary movements, as documented in texts such as the *Surya Siddhanta*. Pingala's binary system laid the foundation for modern computer science. Advances in metallurgy are evident in the rust-resistant Iron Pillar of Delhi and early zinc distillation techniques. Panini's *Ashtadhyayi* demonstrated linguistic precision comparable to modern computational linguistics, reflecting the depth of Indian scientific thought.

From the Health and Medicine Perspective: Ayurveda emphasizes preventive healthcare through balance among the three doshas—Vata, Pitta, and Kapha—using diet, herbs, detoxification, yoga, and meditation. Charaka and Sushruta systematized medical ethics, diagnosis, internal medicine, and surgery, including complex procedures. Yoga, codified by Patanjali, promotes holistic well-being and self-realization. Additionally, Siddha and Unani systems enriched India's medical heritage, offering holistic alternatives to modern biomedicine.

Architecture and Engineering Temple Architecture: Ancient Indian Temple architecture, from the rock-cut caves of Ajanta to the grand temples of Khajuraho, reflects a synthesis of science, art, and spirituality. Khajuraho and Hampi, showcase intricate design and engineering skills. Water Management: Techniques for irrigation and water conservation, seen in ancient heritages like the step wells and tanks, were highly advanced. It plays a crucial role in preserving and transmitting India's rich cultural legacy through generations. The Indian Knowledge heritage is characterized by its holistic and integrative approach, where knowledge from various domains is interconnected and applied to enhance human life and society. The Indian Knowledge heritage is characterized by its holistic and integrative approach, where knowledge from various domains is interconnected and applied to enhance human life and society.

From the Ethical Point of View: In the context of ethics, IKH represents the moral and ethical frameworks derived from ancient Indian philosophical traditions. These include concepts of Dharma, Karma, and the pursuit of higher values that guide personal conduct and societal norms.

From the Holistic Point of View: The Indian Knowledge heritage is a multidimensional approach to understanding the universe, integrating aspects of Philosophy, Science, Spirituality and Cultural practices into a unified framework. It emphasizes a balanced and interconnected view of human

life and the natural environment. Each definition highlights different facets of IKH, reflecting its complexity and its role in shaping various aspects of Indian thought and practice.

Here are some famous quotes based on the Indian Knowledge heritage (IKH) along with their authors:

"Yoga is the journey of the self, through the self, to the self."— **Bhagavad Gita**

"The greatest wealth is to live content with little."— **Socrates** (often quoted in Indian philosophical contexts)

"The more we learn, the more we realize how much we do not know."— **Sankara (Adi Shankar Acharya)**

"The mind is everything. What you think you become."— **Buddha**

"Knowledge is not merely the acquisition of facts; it is the understanding of the principles underlying those facts."— **Swami Vivekananda**

"The highest education is that which does not merely give us information but makes our life in harmony with all existence."— **Rabindranath Tagore**

These quotes reflect various aspects of the Indian Knowledge heritage, including its emphasis on wisdom, self-realization, and the integration of knowledge and practice.

Dr. Ramesh Pokhriyal Nishank, Former Minister of Education, Government of India said that "The National Education Policy 2020 is a step towards building an education heritage that is inclusive, innovative, and ensures that every child has access to quality education."

Narendra Modi, Prime Minister of India said that "The NEP 2020 is designed to foster creativity, critical thinking, and the ability to apply knowledge in practical and real-world contexts."

 According to K. Kasturirangan, Chairman of the NEP 2020 Committee "Our vision for NEP 2020 is to create a robust and forward-looking education heritage that meets the needs of a rapidly evolving world and fosters lifelong learning."

Amit Khare, Secretary, Higher Education, Government of India "NEP 2020 represents a paradigm shift in our approach to education, focusing on holistic development, and bridging gaps between traditional learning and modern requirements."

These statements reflect the key objectives and aspirations of the National Education Policy 2020, emphasizing its transformative impact on the Indian education heritage.

REVIEW OF RELATED LITERATURE

Banga (2010) analysed the key national advances in higher education for sustainable development in India and highlighted the varied educational strategies that are emerging in relation with education for sustainable development. **Jagadesh (2020)** emphasized that NEP-2020 is a timely and futuristic approach, which will lead in promoting critical thinking, competency and making learning experiential. It will lead to preparing students to actively contribute to the economic progress of the nation. **Kannan (2020)**, views that NEP- 2020 is the vision that the policy has for the country as a whole and its documents are visionary in character. The study determined that the NEP- 2020 is of vision to change not only the education field but also expected to impact the nation's growth. **Kumar (2021**) conducted exploratory research based on secondary data in which he viewed that the implementation of NEP-2020 is part of a progressive reform in the existing education system. It concluded that the execution of NEP will lead to boosting the skill development and the pursuit of higher education in students by remodelling the educational system of India. Patil (2021) believes that the new National Education Policy will result in promoting Indian value-based education, Bharat-centric education, development of knowledge-based society, and emphasis on knowledge-based education. The paper identifies the intrinsic and extrinsic factors which will motivate and satisfy faculties in higher education.

The Indian Knowledge Heritage (IKH) encompasses the vast area of traditional knowledge, practices, and wisdom developed in the Indian subcontinent over millennia. It integrates various fields, including philosophy, science, mathematics, medicine, arts, and more. Here's a detailed overview:

RELEVANCE IN MODERN CONTEXT IN TODAY'S INTERCONNECTED WORLD

The Indian Knowledge System offers practical solutions to pressing challenges. Environmental ethics in ancient texts, such as reverence for rivers, forests, and biodiversity, align with modern sustainability goals. Concepts of Ahimsa (non-violence) and Sarvodaya (welfare of all) influenced leaders like Mahatma Gandhi and resonate with global peace movements Yoga and Ayurveda are now integral to global wellness industries. In technology and management, principles of IKS are being applied to artificial intelligence, systems thinking, and ethical leadership. The UN's recognition of International Yoga Day underscores the universal appeal of Indian traditions. Thus, IKS acts as a bridge between tradition and innovation, offering a roadmap for sustainable and inclusive development.

Indian Knowledge System and Ecology

The Indian Knowledge System (IKS) has consistently emphasized harmony between humans and the natural environment. Ancient Indian traditions regarded the five elements—Prithvi (Earth), Jala (Water), Agni (Fire), Vayu (Air), and Akasha (Space)—as the foundation of existence. The Atharva Veda contains hymns that celebrate rivers, forests, and mountains as sacred entities, encouraging respect and preservation. Festivals like Makar Sankranti, Pongal, and Onam symbolize gratitude towards nature's bounty. Sacred groves, protected by communities across. India, served as natural biodiversity reserves. Traditional water management systems, such as step-wells (baolis), tanks, and johads in Rajasthan, demonstrate advanced ecological wisdom by ensuring sustainable water use in arid environments. Such practices are being revived in the context of climate change and global sustainability movements. The concept of **'Sarva Bhoota Hita' (well-being of all living beings)** underscores the ecological ethos of IKS, reminding modern society of the need to balance technological advancement with environmental responsibility. In modern times, Indian thinkers such as Swami Vivekananda, Rabindranath Tagore, and Mahatma Gandhi brought IKS values—spirituality, non-violence, and holistic education—onto the global stage. Today, yoga, meditation, and Ayurveda are part of international wellness and healthcare programs. The recognition of International **Yoga Day** by the United Nations in 2015 highlights the global acceptance and relevance of IKS. This worldwide influence underscores how Indian traditions have not only survived but also shaped and enriched global civilization.

INDIAN KNOWLEDGE SYSTEM AND SPIRITUALITY/MINDFULNESS

• **Meditation, mindfulness, and ethical living are integral to IKS.**

• **Texts like the Bhagavad Gita, Yoga Sutras, and Upanishads guide mental well-being and decision making.**

• **Modern relevance: Stress management, corporate mindfulness programs, global therapy practices**

The National Education Policy (NEP) 2020 of India emphasizes a holistic and integrative approach to education, aiming to incorporate a wide range of knowledge heritages, including the Indian Knowledge System (IKS). NEP 2020 emphasizes IKS to foster creativity, critical thinking, and ethical grounding in education. Here's how IKH connects with NEP 2020.

Integrative Learning Approach NEP 2020: It encourages an interdisciplinary approach to education, integrating various knowledge heritages and practical skills into the curriculum. Connection with IKH: NEP 2020's push for integrating traditional knowledge with modern education reflects the essence of IKH, which historically combines various fields of knowledge. Example: The curriculum might incorporate Ayurveda in health education modules, providing students with insights into traditional medical practices alongside contemporary health science

Revitalization of Traditional Knowledge NEP 2020: Promotes the inclusion of traditional knowledge heritages, arts, and culture in the educational framework to preserve and enhance cultural heritage. Connection with IKH: IKH's focus on preserving cultural and traditional knowledge aligns with NEP 2020's objective to revitalize and integrate traditional knowledge into modern education. Example: Classical Indian arts such as Bharatanatyam and Kathak could be included as part of the curriculum, not only as art forms but as vehicles to teach historical and philosophical narratives.

Focus on Multidisciplinary Education NEP 2020: Advocates for a multidisciplinary approach where students can explore and integrate knowledge across different domains. Connection with IKH. IKH is inherently multidisciplinary, blending Philosophy, Science, Arts, and Ethics into a unified worldview. For example: Mathematics and Astronomy could be taught together,

demonstrating how Ancient Indian Mathematicians like Aryabhata applied mathematical principles to astronomical observations, thus integrating historical, scientific, and mathematical knowledge

Holistic Development & NEP 2020: Emphasizes holistic development, including mental and emotional well-being alongside academic achievement. Connection with IKH: Traditional Indian education heritages have long incorporated holistic approaches to personal development, including aspects of mental and emotional well-being. Example: Yoga and meditation practices could be integrated into the school curriculum to promote students' overall well-being, reflecting IKH's emphasis on mental and spiritual health.

Local and Indigenous Knowledge NEP 2020: Encourages the inclusion of local and indigenous knowledge and languages in the education heritage to foster regional identity and cultural diversity. Connection with IKH: IKH includes a wide array of regional and indigenous knowledge heritages, reflecting the diverse cultural heritage of India. Example: Local craftsmanship and folklore could be part of vocational training programs, preserving and promoting traditional skills and cultural practices.

Ethics and Values NEP 2020: Stresses the importance of imparting ethical values and citizenship education. Connection with IKH. Ethical and moral teachings are central to IKH, with a strong emphasis on values derived from philosophical and spiritual traditions. NEP 2020's emphasis on integrating traditional knowledge, promoting holistic development, and fostering multidisciplinary learning resonates deeply with the principles of IKH. By incorporating elements of IKH into the modern educational framework, NEP 2020 aims to create a more comprehensive and culturally grounded education heritage that respects and utilizes India's rich intellectual heritage. Both the Indian Knowledge heritage (IKH) and the **National Education Policy (NEP) 202**0 are crucial to India's education heritage, So, they are considered the backbone of the education heritage.

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INDIAN KNOWLEDGE SYSTEM AND ARTIFICIAL INTELLIGENCE IN EDUCATION: EPISTEMIC AND PEDAGOGICAL INQUIRY, PEDAGOGICAL CONVERGENCE, COGNITIVE AUGMENTATION, FUTURE TRAJECTORIES AND ETHICAL PARADIGMS

Ms. Rohini*

ABSTRACT

The confluence of the Indian Knowledge System (IKS) and Artificial Intelligence (AI) in education presents a paradigm shift in pedagogical methodologies, cognitive modelling, and ethical imperatives. IKS, deeply rooted in epistemological pluralism, heuristic learning, and experiential cognition, offers a sophisticated framework that transcends mechanistic knowledge transmission. AI, on the other hand, has revolutionized education through intelligent tutoring systems, cognitive analytics, and personalized learning trajectories. This paper explores the synergies between IKS and AI, advocating for an integrative educational model that synthesizes the wisdom-centric traditions of IKS with the computational efficacy of AI. By examining pedagogical architectonics, cognitive augmentation, and ethical dimensions, this study postulates that the fusion of IKS and AI can engender an educational ecosystem that is intellectually enriched, ethically grounded, and dynamically adaptive to evolving cognitive landscapes.

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INTRODUCTION

Education has always been the cornerstone of human civilization, shaping intellectual discourse, technological evolution, and societal structures. In contemporary times, Artificial Intelligence (AI) has emerged as a transformative force in education, reconfiguring pedagogical methodologies, cognitive modelling, and instructional design (Seldon, 2024). Concurrently, the Indian Knowledge System (IKS), an ancient yet perpetually relevant epistemic tradition, offers a sophisticated intellectual framework that transcends reductionist paradigms of learning. The integration of IKS

and AI, therefore, presents an unprecedented opportunity to synthesize traditional wisdom with computational intelligence, fostering an educational paradigm that is holistic, adaptable, and ethically informed (Kaur, & Singh, 2022; MoE, GoI, 2021; NEA, 2023).

The Indian Knowledge System, deeply rooted in epistemological pluralism and experiential cognition, encompasses a vast corpus of knowledge spanning disciplines such as logic (Nyāya), metaphysics (Vedānta), medicine (Ayurveda), mathematics (Vedic Ganita), and linguistics (Vyākaraṇa) (Chakrabarti, 2019; Das, 2020; Patel, & Joshi, 2021). Unlike mechanistic and algorithmic learning models, IKS advances a holistic, multi-perspectival approach that emphasizes heuristic learning, oral transmission, and an intrinsic connection between knowledge and ethical praxis. The pedagogical methodologies embedded in IKS, particularly the Gurukula system, prioritize mentor-disciple interaction, self-inquiry (svādhyāya), and dialectical reasoning (vāda), cultivating an intellectually rigorous and ethically conscious educational experience.

AI, on the other hand, has revolutionized the modern educational landscape by enabling adaptive learning environments, personalized curricula, and cognitive analytics. From intelligent tutoring systems (ITS) to machine learning-driven educational platforms, AI has the potential to enhance instructional efficacy, optimize learning trajectories, and provide scalable educational solutions (DiCerbo, 2024; Kamalov, Calong, & Gurrib, 2023). However, AI-driven education often lacks the ethical and wisdom-centric dimensions that are integral to IKS, necessitating a harmonized approach that integrates the two paradigms (Seldon, & Abidoye, 2018).

This paper argues that the convergence of IKS and AI in education is not merely an intersection of disparate knowledge systems but a profound epistemic synthesis that can redefine the future of learning. By leveraging the heuristic and experiential wisdom of IKS alongside the computational capabilities of AI, this integrative framework aspires to create a pedagogical model that is intellectually enriched, ethically grounded, and dynamically responsive to the evolving cognitive landscape. The subsequent sections will delve into the philosophical foundations, pedagogical methodologies, and ethical imperatives of this synthesis, proposing an educational model that embodies the best of both worlds.

THE INDIAN KNOWLEDGE SYSTEM – AN EPISTEMIC AND PEDAGOGICAL INQUIRY

Conceptual Foundations of the Indian Knowledge System (IKS)

The Indian Knowledge System (IKS) embodies an extensive epistemological tradition, encapsulating a confluence of metaphysical inquiry, scientific rigor, and pedagogical sophistication (Balachandran, 2021). Unlike the reductionist paradigms of contemporary knowledge frameworks, IKS advances a holistic, integrative, and multidimensional approach to cognition and education (MoE, GoI, 2023). It is predicated upon the synthesis of empirical reasoning (pratyakṣa), inferential logic (anumāna), authoritative testimony (řabda), and meditative intuition (yoga-pratyakṣa), thereby fostering a pluralistic and deeply interconnected intellectual tradition.

Historically, IKS has been nurtured within an array of disciplinary domains, encompassing Vedic sciences, Nyāya logic, Sāmkhya metaphysics, Ayurveda, mathematics, and cosmology. These traditions have served as the bedrock for profound advancements in areas such as linguistic analysis, computational astronomy, and cognitive science. The epistemic structure of IKS, rooted in the six orthodox darśanas (philosophical systems), advances a multi-perspectival cognition that transcends the dichotomies of subjectivity and objectivity, integrating ethical and metaphysical dimensions with empirical inquiry (Sharma, 2024).

In its methodological expanse, IKS also incorporates oral traditions, mnemonic techniques, and heuristic pedagogical models that emphasize knowledge transmission through embodied cognition. This integration of theoretical and experiential dimensions is a hallmark of IKS, rendering it uniquely resilient across millennia of socio-cultural transformations.

Pedagogical Architectonics of IKS

The pedagogical methodologies of IKS are deeply entrenched in heuristic learning, intergenerational knowledge transmission, and immersive experientialism. The Gurukula system, which epitomizes the quintessential educational paradigm of IKS, is an archetype of mentor-disciple pedagogy that emphasizes not merely the transmission of knowledge but the cultivation of wisdom (vidyā) and moral-ethical consciousness (dharma). This paradigm fosters an intimate

intellectual and spiritual engagement between the teacher (guru) and the student (śiṣya), ensuring the holistic development of the learner.

A defining attribute of IKS pedagogy is its emphasis on experiential epistemology, where knowledge acquisition is inextricably linked to lived experience. Unlike rote memorization models prevalent in contemporary educational structures, IKS encourages an embodied and praxis-oriented approach to learning. Disciplines such as Ayurveda, for instance, integrate empirical observations with intuitive diagnostics, while Vedantic pedagogy necessitates deep meditative introspection alongside textual exegesis.

The interdisciplinary nature of IKS also manifests in its synthesis of diverse domains of knowledge. The tradition of śāstra-pāṇha (scriptural study) interweaves linguistics, logic, and metaphysics, while Vedic mathematics exhibits an inherent algorithmic structure, prefiguring modern computational logic. Furthermore, indigenous artistic traditions, such as Nāṣyaśāstra (the dramaturgical treatise), encapsulate cognitive psychology, semiotics, and performative aesthetics within an integrated pedagogical schema.

Moreover, the pedagogical principles of IKS prioritize self-inquiry (svādhyāya) and intellectual autonomy, fostering an educational ethos where learners are encouraged to engage in hermeneutic reflexivity rather than passive reception of information. This dynamic and dialogic approach is evident in the Upaniṣadic tradition, where dialectical discourse (vāda) and critical interrogation (tarka) serve as foundational tools for epistemic inquiry.

Cognitive and Metaphysical Underpinnings

At the core of IKS lies an intricate philosophical and cognitive architecture that extends beyond mechanistic paradigms of learning. The ontological foundation of IKS is deeply enmeshed in the concept of consciousness (caitanya) as the substratum of intelligence, diverging from contemporary reductionist views that ascribe cognition to mere neural activity. The epistemic frameworks within IKS delineate multiple pramāṇas (means of knowledge), each elucidating different modalities of acquiring and validating knowledge.

One of the most profound cognitive models in IKS is that of Nyāya epistemology, which formulates a rigorous analytical structure for logical inference, argumentation, and dialectical reasoning. The Tarka-śāstra (science of reasoning) within the Nyāya tradition advances a

methodological rigor akin to modern computational logic, laying the groundwork for algorithmic thinking. Similarly, the Advaita Vedānta framework articulates a non-dualistic conception of cognition, positing that knowledge acquisition is not merely an external accumulation but an ontological realization of the Self (Atman) as Brahman.

ARTIFICIAL INTELLIGENCE IN EDUCATION–PEDAGOGICAL CONVERGENCE AND COGNITIVE AUGMENTATION

The Technological Metamorphosis of Education via AI

The advent of Artificial Intelligence (AI) has instigated a fundamental transformation in the educational domain, engendering hyper-personalized learning environments, intelligent tutoring architectures, and cognitive analytics. AI-driven education departs from the traditional one-size-fits-all model by deploying machine learning algorithms capable of adapting pedagogical content to individual cognitive profiles (Sridharan, & Mukherjee, 2023). This evolution signifies a shift toward a more responsive, adaptive, and data-driven educational paradigm.

Intelligent Tutoring Systems and Personalized Learning

Artificial Intelligence has pioneered a paradigm shift in educational technology through the development of Intelligent Tutoring Systems (ITS), which dynamically adjust instructional content based on learner behavior (Mallik, & Gangopadhyay, 2023). These AI-driven tutors leverage predictive analytics, deep learning models, and natural language processing to offer real-time cognitive feedback, facilitating individualized learning trajectories that resonate with IKS's contextual and personalized pedagogical traditions.

Furthermore, adaptive learning platforms integrate reinforcement learning algorithms to assess and refine students' comprehension in real time. These platforms employ cognitive scaffolding mechanisms, similar to those found in IKS, ensuring knowledge is imparted in a layered and recursive manner, akin to the dialectical progression in Nyāya and Mimāṃsā epistemology.

AI-Driven Cognitive Modeling and Educational Neuroscience

AI's integration into educational neuroscience has ushered in an era of cognitive modeling, enabling a granular understanding of knowledge acquisition, memory retention, and metacognition. These insights can inform pedagogical frameworks that mirror IKS's emphasis on

heuristic and embodied learning, reinforcing experiential knowledge acquisition through AI-mediated simulation environments.

Educational neuroscience, augmented by AI, has yielded significant advancements in understanding neural correlates of learning. AI-powered neuroimaging techniques and brain-computer interfaces (BCIs) facilitate real-time monitoring of neural activity, offering a deeper understanding of cognitive engagement and knowledge acquisition. These innovations hold the potential to revolutionize educational paradigms by enabling the customization of learning experiences based on students' cognitive profiles.

The Role of AI in Enhancing Traditional Indian Pedagogical Methods

The Indian Knowledge System (IKS) is characterized by its emphasis on experiential learning, heuristic reasoning, and epistemological pluralism. AI can serve as a catalyst in preserving and augmenting traditional Indian pedagogical methodologies, bridging the gap between ancient wisdom and contemporary technological advancements.

AI-driven platforms can digitize and analyze classical Indian texts, facilitating the preservation and dissemination of indigenous knowledge. For instance, natural language processing (NLP) techniques can be employed to translate and interpret Sanskrit scriptures, ensuring accessibility to a wider audience. Additionally, AI-powered virtual assistants can simulate interactions with historical scholars, allowing students to engage in dialectical reasoning and immersive learning experiences.

Furthermore, AI can enhance the Gurukula system by integrating adaptive learning technologies with traditional mentor-disciple pedagogies. By personalizing instruction based on students' cognitive aptitudes and learning preferences, AI can reinforce the foundational tenets of IKS while leveraging computational efficiency.

CHALLENGES AND ETHICAL CONSIDERATIONS IN AI-DRIVEN EDUCATION

Despite its transformative potential, the integration of AI in education presents several challenges and ethical considerations. Algorithmic bias, data privacy concerns, and the risk of over-reliance on AI-driven automation necessitate critical scrutiny. Ethical frameworks grounded in IKS

principles can offer guidance in addressing these challenges, ensuring that AI is deployed responsibly and inclusively.

The principle of loka- saṅgraha (universal well-being) underscores the ethical imperative of utilizing AI for societal benefit. AI-driven educational interventions must align with dharma-centric principles that prioritize equity, inclusivity, and holistic intellectual development. Additionally, transparency and accountability in AI decision-making processes are essential to prevent epistemic injustices and safeguard human agency in education.

By integrating AI within an IKS-driven ethical and pedagogical framework, education can evolve into a wisdom-centric enterprise that harmonizes technological advancements with intellectual traditions. This synthesis ensures that AI remains an enabler of cognitive augmentation rather than a replacement for human intuition and ethical discernment.

SYNTHESIZING IKS AND AI – FUTURE TRAJECTORIES AND ETHICAL PARADIGMS

The Convergence of IKS and AI-Driven Pedagogy

The intersection of IKS and AI-driven pedagogy engenders an educational paradigm that transcends conventional mechanistic approaches (Sharma, 2022). The synthesis of these two distinct yet complementary systems fosters a learning environment that harmonizes the cognitive rigor of AI with the heuristic wisdom of IKS. By leveraging AI's data-driven adaptability alongside IKS's multi-dimensional epistemology, a more inclusive and intellectually enriched model of education emerges. This integrative approach facilitates personalized learning experiences while preserving the deeply embedded values of self-inquiry, ethical reflection, and intergenerational wisdom transmission characteristic of IKS.

One of the most compelling applications of this synthesis is the development of AI-enhanced Gurukula systems, where intelligent tutoring systems (ITS) are aligned with traditional mentor-disciple dynamics. By incorporating machine learning algorithms to adapt to the unique cognitive profiles of students, AI can enhance the efficacy of personalized learning while ensuring that knowledge acquisition remains rooted in the philosophical and ethical tenets of IKS (Sharma, 2022).

Furthermore, AI-driven knowledge repositories infused with IKS principles can facilitate dynamic, context-aware learning experiences. For instance, AI models trained on IKS texts, such as the Nyāya Sūtras or the Upanishads, can engage students in dialectical reasoning exercises, simulating the interactive learning experiences inherent in traditional śāstra-pāṇha methodologies.

The integration of IKS with AI heralds a new frontier in education, where ancient wisdom traditions coalesce with cutting-edge computational paradigms. AI can function as a facilitator of experiential learning by deploying immersive virtual environments that emulate traditional gurukula settings, fostering deep cognitive engagement (Dalrymple, 2024).

Moreover, neurosymbolic AI, which integrates logical reasoning with deep learning, mirrors IKS's multi-layered cognitive models, enhancing AI's ability to process complex epistemic structures. By embedding IKS's hermeneutic and dialectical reasoning frameworks within AI-based education, we can cultivate context-sensitive learning environments that surpass mechanistic information retrieval.

Ethical Considerations and Indic Ethical Paradigms

The ethical dimensions of AI-driven education necessitate a critical examination through the lens of IKS. Unlike contemporary AI ethics, which often center around Western philosophical constructs, Indic ethical paradigms offer a holistic and dharma-centric framework for evaluating AI's role in education. The principle of loka-saṅgraha (universal well-being), as emphasized in the Bhagavad Gītā, advocates for the responsible and welfare-oriented use of knowledge—a principle that should govern AI-driven educational initiatives.

Incorporating IKS-based ethical constructs such as śreyas (long-term well-being) and niṣkāma karma (selfless action) into AI development can counteract the pitfalls of algorithmic biases and dehumanization in education. AI models designed with these ethical principles can ensure that learning remains a means of intellectual and moral refinement rather than a mechanistic optimization of performance metrics.

Moreover, IKS provides a framework for addressing AI's existential risks by advocating for the prudent and harmonious integration of technology. The concept of rta (cosmic order) underscores the necessity of maintaining balance between human intellect and artificial cognition, ensuring that AI serves as an enabler rather than a disruptor of holistic education.

The ethical integration of AI into education necessitates an adherence to Indic ethical paradigms, ensuring that AI remains a means of intellectual augmentation rather than cognitive subjugation. Future AI models must incorporate context-aware ethical reasoning inspired by IKS's dharma-centric worldview, embedding principles such as compassion (karuṇā), equity (samatā), and self-regulation (niyama) into AI-driven pedagogy.

In sum, the symbiotic integration of IKS and AI will shape an intellectually enriched, ethically grounded, and holistically transformative educational paradigm, fostering the evolution of wisdom-driven AI ecosystems that transcend mere automation and cultivate profound cognitive and spiritual growth.

The Evolution of Wisdom-Driven AI Ecosystems

A wisdom-driven AI ecosystem, inspired by IKS, necessitates an evolution from mere data-driven intelligence to sapiential intelligence—an intelligence that embodies discernment, ethical consciousness, and self-reflective awareness. This paradigm envisions AI as a collaborator in human cognitive expansion rather than a mere executor of algorithmic functions.

Such a system would leverage AI not only for content dissemination but also for fostering deeper cognitive inquiry, creative problem-solving, and moral development. AI models inspired by IKS methodologies can integrate multi-modal learning, encompassing textual exegesis, oral traditions, and experiential knowledge acquisition.

One potential innovation in this trajectory is the development of AI avatars modelled after historical scholars of IKS, such as Pāṇini, Ādi Śaṅkarācārya, and Bhāskarācārya. These AI-driven mentors could guide students through dialectical debates, perform computational analyses based on ancient mathematical principles, and provide contextual interpretations of philosophical texts (Das, 2020; Mishra, 2023).

By embedding AI within an IKS-driven ethical and pedagogical matrix, education can evolve into a wisdom-centric enterprise that is both technologically sophisticated and deeply rooted in intellectual traditions. This symbiosis ensures that AI remains an instrument of cognitive augmentation rather than an entity that supersedes human wisdom.

CONCLUSION

The fusion of the Indian Knowledge System and Artificial Intelligence in education presents a transformative framework that is both intellectually robust and ethically grounded. IKS, with its deep epistemological roots and heuristic pedagogy, provides an essential counterbalance to the mechanistic tendencies of AI-driven education. By integrating IKS principles with AI's computational prowess, a pedagogical model emerges that fosters cognitive depth, ethical introspection, and adaptive learning (Chakrabarty, Jigeesh, & Sreeparna, 2023; Francis, 2025).

This paper has delineated the foundational aspects of IKS, examined AI's role in reshaping education, and explored the future trajectories of their convergence. The synthesis of these paradigms offers profound implications for the evolution of AI-driven wisdom ecosystems that prioritize knowledge as a vehicle for self-discovery, ethical integrity, and societal well-being.

Future research should explore the development of AI models trained in IKS methodologies, investigate the potential for AI-enhanced Gurukula systems, and formulate ethical guidelines that ensure AI's alignment with dharma-centric educational principles. By advancing this discourse, academia and industry can collaboratively shape an educational future that transcends conventional paradigms, embracing an integrative vision where technology and tradition coalesce to elevate human cognition and wisdom.

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UNDERSTANDING THE 'RATIONALISATION' OF POLITICAL SCIENCE TEXTBOOKS: A STUDY OF THE VIEWS OF SUBJECT EXPERTS AND TEACHERS

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ABSTRACT

The NCERT's attempts at "rationalising" the school textbooks (prepared after NCF-2005) have been in the news and have also raised controversy. Rationalising entails determining the choice of how to write a text through rational and logical explanations. The reason for what is deleted from an existing text has to be explained. Rationalisation means giving a justifiable explanation for the changes being made. The deletion of sentences, paragraphs, sections, or chapters in a text is not itself a rationalisation; rather, it is a rationing of what is being presented. The NCERT started its recent syllabus rationalisation project in December 2021 and finished it in June 2022.

The NCERT says that rationalising textbooks is to "reduce the content load". The NCERT asserts that they rationalised the content in these textbooks for 2022-23 and will continue to use the same textbooks for 2023-24. The National Education Policy 2020 also stresses the need to cut down on the amount of information students have to study and give them chances to learn through experience while being creative. Further, overlapping content, "difficulty level," and "content that is irrelevant in the present context" are factors cited by the NCERT to justify rationalisation.

The paper aims at studying the views of university professors of political science and schoolteachers (who teach social science or political science) on the changes made in the political science textbooks by the NCERT.

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INTRODUCTION

Politics often affect what and how schools educate, which makes education a crucial part of society. Therefore, there is a close relationship between politics and curriculum changes. The national and state governments in our country determine the educational priorities, curriculum, textbooks, teaching techniques, and testing methods. Political beliefs, social ideals, and economic factors can influence these policies.

In our society, political leaders are having more and more of an impact on the content, structure, and priorities of national educational programmes. Consequently, our nation intricately connects politics and curriculum reform, potentially influencing students, educators, educational institutions, and society as a whole.

Michael Apple (1993), a distinguished scholar in curriculum theory, critical pedagogy, and the politics of education, has conducted an extensive analysis of the concept of "official knowledge politics." He underscores the imperative of critically assessing how education reflects and perpetuates societal injustices while also serving as a site of resistance and transformation. Political, social, and cultural forces significantly shape educational knowledge, asserts Apple (1993). He stresses that the school curriculum and how it is taught reflect the values, ideas, and opinions of the main social groupings, ideologies, and power structures in society. These beliefs can make current power dynamics stronger and push the experiences and points of view of minority or disadvantaged groups to the side. "Official knowledge," which schools and other authorities sanction, usually makes social hierarchies and inequalities worse.

DEBATES ABOUT NCERT'S CHANGES TO TEXTBOOKS

After the release of the National Curriculum Framework (NCF) 2000, the changes to NCERT textbooks sparked numerous discussions in India. How textbooks depicted historical events and individuals was one of the key causes of contention. People who didn't like the new textbooks argued they presented a skewed or politically influenced picture of history, especially when it came to ancient Indian history, the freedom movement, and the roles of historical leaders like Mahatma Gandhi and Jawaharlal Nehru. Changes to NCERT textbooks have led to arguments on how to show religious and cultural identities. Some people argued that the textbooks were biased toward

some religious or cultural groups and didn't pay attention to others. People said that these arguments were unfair and that they changed the facts of history.

Another topic of contention was the treatment of linguistic diversity and regional languages in textbooks. Critics expressed concern over the neglect or inadequate representation of certain regional languages and cultures in textbooks. They argued that the teaching materials should be more open to other cultures and people. Some people stated that politics got in the way of the review process, and others said that the government was forcing its notions about what students should study on them. People were anxious about how independent and honest the process of updating textbooks was, which led to calls for more openness and responsibility in how decisions are made. Critics also said that the new textbooks didn't meet educational requirements and were of poor quality. They said they were mistaken, out of date, and didn't include adequate critical analysis.

The arguments about the revisions to NCERT textbooks following NCF 2000 were part of wider conversations about the content of education, representation, diversity, and the role of politics in creating the curriculum. These arguments emphasized how crucial it is to ensure that educational materials are correct, fair, and honest and that everyone is included in the process of altering the curriculum.

OBJECTIVE AND METHODS

The objective of this study is to document the opinions expressed by various stakeholders in response to the recent curricular changes, as well as the justification provided by NCERT personnel.

I have used document analysis to examine the modifications included in the political science textbooks for grades 6–12. Similarly, I have examined articles from newspapers or journals to understand the perspectives of various groups. The analysis has been conducted in an open-ended, qualitative approach, entailing the reading and rereading of data sources, including NCERT textbooks and numerous media and journal articles.

FINDINGS

The "Rationalisation" of NCERT Textbooks

It's important to note that the NCERT has not only updated the textbooks, but it has also updated the National Curriculum Framework after 14 years to follow the National Education Policy (NEP) 2020. The NCERT has changed the NCF four times before: in 1975, 1988, 2000, and 2005. These adjustments were adjusted to fit with the new syllabus, and schools are now using the NCERT syllabus for the 2023–2024 school years (Porecha, 2023).

Dinesh Saklani, the head of NCERT, called the choice to omit a few chapters "syllabus rationalisation". When you rationalise what has been written, you use logical and reasonable reasons to decide how a text should be written. You need to explain why you are deleting something from a text that already exists. Rationalisation requires providing a compelling rationale for the proposed changes. Removing phrases, paragraphs, sections, or chapters from a text does not constitute a rationalisation; rather, it serves to restrict the scope of the presentation. Many opponents have said that the NCERT has mixed up "rationalising" with "rationing" and has just chopped out large parts of the textbooks to say that the pupils have less to learn.

The NCERT has lately come out with a list of "rationalised content," which is material that will be taken out of textbooks for grades 6–12. The NCERT has made modifications to 1,334 books in its syllabus for various grades. Some of the writings that were removed were about the Mughal era, the Delhi Sultanate, and the part that Hindu extremist groups played in the killing of Mahatma Gandhi (Chogule, 2023).

According to reports, the NCERT has put out a new set of textbooks. In the history textbook for class XII, a whole chapter about the Mughal Empire has been taken out. The chapter is about how the imperial courts worked. The Union government runs the Central Board of Secondary Education, which uses NCERT textbooks for its pupils. Reports say that certain courses have taken off pages about the Mughal monarchs and the Delhi Sultanate from their textbooks. Students will still learn about the Mughals, but they will learn less about the major emperors of India and their accomplishments. Their legacy lives on in India's architecture and culture (Ahmed, 2023).

NCERT has given a number of reasons for "rationalising" textbooks. The NCERT staffs have cited many reasons for the adjustments they made to the NCERT syllabus. Here are some of them:

The previous syllabus doesn't fit with the new standards for schools. It is necessary to update the current NCERT syllabus and verify that it follows the new education policy in order to make sure it meets the new goals, priorities, and guidelines.

Some parts of the curriculum may feature information that is no longer useful or important for students in today's society. The current syllabus doesn't include topics like demonetisation, "Beti Bachao Beti Padhao", Digital India, GST, and so on.

People criticise the NCERT syllabus because it can be unfair or inadequate. This could mean showing historical events, political issues, or cultural traits in a way that appears to favour a certain point of view or way of thinking.

The syllabus may not properly reflect India's broad cultural, linguistic, and socioeconomic origins, which could make it harder to grasp and appreciate the country's rich history and diversity. For example, the Mughal Empire obtained more space.

People sometimes claim that the NCERT syllabus is too vast and demanding, which means that kids have a lot of work to do. This can be detrimental for their mental and physical health. Teachers, students, and other interested parties can suggest changes to the curriculum to keep it useful and entertaining.

OPINIONS OF STAKEHOLDERS REGARDING NCERT'S TEXTBOOK RATIONALISATION

After the chapter about the Mughals was taken out, political scientists Suhas Palshikar and Yogendra Yadav, who were advisors for political science books that were first released in 2006 for classes 9 to 12, wrote to NCERT and asked to have their names taken off the print and digital editions of the books. The academics said they objected to the "innumerable and irrational cuts and large deletions" because they couldn't see "any pedagogical rationale" behind the changes. They thought the exercise was politically motivated and aimed at erasing or distorting certain

aspects of India's history, culture, and diversity that don't fit with the ruling establishment's ideology. Others thought the exercise was at odds with NEP-2020's progressive focus on critical thinking, multidisciplinary learning, and respect for diversity (Kumar, 2023).

Many other critics have said that the "rationalisation" process was not open or involved enough with a wide range of people, including teachers, students, parents, professors, and civil society groups. They said the practice was pointless and wouldn't help with the learning losses caused by the Covid-19 epidemic, which need to be fixed in the classroom and by giving instructors more power. Many of the country's top scientists have also expressed reservations about the curriculum's depth and breadth, particularly the removal of important chapters like the Periodic Table, Darwin's theory of evolution, and Fibre and Fabrics.

The deadlock got worse when more than 30 academics wrote to NCERT asking for their names to be taken off the Textbook Development Committees (TDC) listed in the books. The scholars argued that NCERT's copyright ownership did not give them the authority to modify the texts they authored. However, NCERT said that the TDC's role was "limited to advising how to design and develop the textbooks or contributing to the development of their contents and not beyond this" (Banerjee, 2023).

Over 250 historians, including Romila Thapar and Jayati Ghosh, signed a public statement condemning the NCERT's decision to change school textbooks for the 2023-24 academic year without consulting experts who have worked on NCERT textbooks in the past. They also said that the changes went against India's constitutional ethos. The statement was signed by academics from several educational institutions, such as Jadavpur University, Jawaharlal Nehru University, Delhi University, Ashoka University, and the University of Amsterdam.

"We are shocked by the NCERT's choice to take out chapters and statements from history textbooks," the statement added. "We demand that the deletions be undone." The NCERT's choice is based on motives that divide people. The deletion is a choice that goes against the Indian subcontinent's constitution and its many cultures. We need to reverse this decision as soon as possible. No one but NCERT officials has spoken to the historians and teachers who worked on the textbooks (Tanika, 2019).

Victoria Potshangbam from Kamala Nehru College in DU, Maya John from Jesus & Mary College, and Mukul Mangalik, a retired professor from Ramjas College, are just a few of the people who have signed the petition. Many of the individuals who signed the petition have previously worked on the NCERT syllabus. Critics want this review to be open and cover everything. Suhas Palishkar said, "Textbooks, as the title says, have a special place in the education system. The teacher and student rely on them as their first real source of learning. Many experts agree that a successful curriculum should keep students interested in topics that make them think and ask questions that are important to their lives and other classes. But when "some paragraphs and sentences are deleted without reason,", the flow of the argument in the textbook is broken, which makes it much harder to study.

Mamidala Jagadesh Kumar, the head of the UGC, thinks that these kinds of "arbitrary" reforms cause more harm than beneficial effects. Jagdesh Kumar generally supports the rationalisation efforts, but he agrees with some of the complaints, especially those about science education.

SUPPORT RECEIVED BY THE NCERT

It's fascinating that a day after academics who were on the NCERT's Textbook Development Committee (2005-06) wrote to the curriculum body saying they didn't want changes to political science and history textbooks and asked that their names be taken off of them, more than 100 other academics wrote an open letter in response, supporting the critics. More than 106 academics signed an open letter saying that "critical academics" had tried to "derail" the implementation of NEP 2020 by spreading "misinformation, rumours, and false allegations" (Barman, 2023).

One of the other types of help the NCERT got was a declaration from 73 academics saying that school textbooks needed to be updated badly. The critics say that pupils should keep using 17-year-old textbooks instead of new ones. "They are willing to put the future of crores of children across the country at risk to achieve their political goal," they stated. "As long as it is based on facts and evidence, scrutiny should be praised. Selective reading and mischaracterization do not foster openness or accountability; rather, they undermine them," stated Santishree Dhulipudi Pandit, the vice chancellor of JNU, contending that the media disseminated considerable "unverified" material on the matter (Sharma, 2023).

The NCERT says it asked both in-house faculty members and outside experts to look at the books in question and suggest changes. The process took into account five main factors: overlapping content between different subjects in the same class; similar content between the lower or higher classes in the same subject; difficulty levels; content that is easy for kids to understand and "does not require much intervention from the teachers"; and finally, content that is "not relevant in the present context."

Four members of the council's textbook team wrote in an article in the Indian Express that "either in the same subject in different classes or in a different subject in the same class," they had added "relevant information that was removed or rationalised." They also said, "The periodic table has not been removed entirely from Class 9 and 10 textbooks but instead reassigned to the Class 11 textbook. Mughal history remains partially in the curriculum. And Darwin's theory of evolution is covered in chapter six of the Class 12 textbook."

In response to critics who were upset that some items were left out of the NCERT notification about textbook rationalisation, the NCERT staff said, "This has nothing to do with any conspiracy but is representative of the regular process of reprinting, where minor deletions are not notified to avoid unnecessary confusion" (Yadav, 2023).

In conclusion, rationalising NCERT textbooks has been a topic of contention and discourse among academicians, educators, and stakeholder groups within the education sector. Although opinions differ, there are several reasons why certain academicians have opposed the rationalisation process (Sharma, 2023):

Critics say that the rationalisation process could make the subject matter less rich. They worry that cutting out or omitting particular topics or ideas could make the information pupils learn less complete and deep.

Opponents of rationalisation argue that it may overlook diverse perspectives, unheard voices, or regional variations. They think a standardised approach might overlook local settings, cultural differences, and inclusive representation.

Critics contend that the simplification of intricate concepts or subjects may impede students' critical thinking skills. They assert that pupils need difficult and intellectually stimulating material that fosters cognitive development and analytical proficiency.

Some scholars are worried that biases or ideological influences could damage the rationalisation process. They think that subjective choices about what to include or leave out could make instructional materials less objective and fair.

It's crucial to remember that these complaints come from a variety of people, and there are also those who favour the process of rationalisation. Supporters of rationalisation say that it makes content more streamlined and up-to-date, makes it clearer, lowers overloads, and improves the overall quality of textbooks.

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INDIAN KNOWLEDGE SYSTEMS AS AN INTERDISCIPLINARY PEDAGOGICAL FRAMEWORK: CULTIVATING 21ST- CENTURY SKILLS THROUGH INDIGENOUS WISDOM IN THE CONTEXT OF NEP 2020.

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ABSTRACT

The evolution of Indian Knowledge Systems (IKS) is rooted in a long tradition of learning that has been shaped by observation, reflection, dialogue, and lived experience. IKS views learning as interconnected, linking the individual to society, nature, ethics, and purpose, not as rigidly divided knowledge. These systems are based on philosophy, science, medicine, mathematics, the arts, ecology, and governance and emphasize holistic understanding, values, and experiential learning.

Education frequently experiences challenges due to fragmented curricula and an overemphasis on memorization in today's fast-paced world. The NEP 2020 responds to this challenge by advocating for interdisciplinary education, skill development, and pedagogy that is learner-centered. This vision closely aligns with the foundational principles of Indian Knowledge Systems. NEP 2020 acknowledges IKS not as historical artifacts, but as valuable tools for shaping modern education.

Through this paper I would like to explore that how IKS is prominent to assist and work as an interdisciplinary pedagogical framework to develop required 21st-century skills such as critical thinking, creativity, communication, collaboration, ethical reasoning, environmental awareness, and allow lifelong learning. During ancient time what we have observed and read that our traditional practices like the Gurukul system, dialogic methods such as Shastrartha and Samvada, and applied knowledge domains including Ayurveda, architecture, astronomy, and environmental management shows how Indian knowledge traditions by default naturally integrate multiple disciplines and has encouraged inquiry-based learning.

Moving further this paper also highlights practical ways to pull-out IKS within modern classrooms by integrating interdisciplinary curriculum design, project-based learning, experiential pedagogy, and the thoughtful use of digital tools. Such integration allows traditional wisdom to engage with contemporary educational needs while remaining relevant to learners.

Indian Knowledge Systems are pedagogical practices that are living and evolving, not static content, and this study demonstrates how they can transform classrooms into spaces for reflection, inquiry, and ethical engagement. The NEP 2020 framework's integration of IKS can create learners who are not only academically proficient, but also culturally rooted, socially responsible, and prepared to navigate complex global challenges.

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INTRODUCTION

Rapid technological advancement, environmental degradation, social inequalities, and shifting economic structures are influencing the thoughtful transformation of education in the twenty-first century. In light of today's global realities, it is necessary for learners to be not only academically competent but also adaptable, ethically grounded, socially responsible, and capable of critical and interdisciplinary thinking. We have had past experiences with conventional models of education, which often characterised by rigid disciplinary, examination-oriented learning, and content-heavy curricula, have questioned rapidly for their limited ability to prepare learners for such complex and interconnected challenges which has thrown by 21st century skills and application-based requirement. As societies seek more holistic, inclusive, and future-ready educational approaches, there is a renewed interest in pedagogical frameworks that integrate knowledge, values, skills, and lived experience. (Kapoor, 2025).

The educational vision offered by Indian Knowledge Systems (IKS) is distinctive and deeply rooted in this context. IKS are much more than just ancient texts or historical traditions; they are a constantly changing and evolving knowledge ecosystem that has been shaped by centuries of inquiry, debate, observation, and practice. The integration of theory and application, cognition and ethics, individual growth and collective well-being, and human development with eco-balance is what these systems aim to achieve. The National Education Policy (NEP) 2020 recognizes the importance of this holistic worldview, and places Indian Knowledge Systems at the forefront of

educational reform, emphasizing interdisciplinary learning, skill development, and value-based education. (Ministry of Human Resource Development, 2020).

OBJECTIVES

The purpose of this paper is to analyze Indian Knowledge Systems as an interdisciplinary pedagogical framework for developing twenty-first-century skills in keeping with the vision and mandates of NEP 2020. The argument contends that IKS offer modern education conceptual depth, pedagogical coherence, and cultural relevance, allowing learners to navigate modern challenges while remaining rooted in ethical and indigenous wisdom.

NEED TO UNDERSTAND INDIAN KNOWLEDGE SYSTEMS

Indian Knowledge Systems encompass various forms of knowledge that have been developed through sustained intellectual engagement, experiential learning, and reflective practice over the years. Rather than being monolithic, these systems are pluralistic, accommodating multiple schools of thought, epistemologies, and methodologies. IKS include philosophical traditions such as Vedanta, Buddhism, Jainism, and Nyaya; scientific and mathematical contributions found in texts like the Sulba Sutras and the astronomical works of Aryabhata; medical systems such as Ayurveda, Siddha, and Yoga; ecological practices embedded in sacred groves and traditional water management systems; artistic and aesthetic traditions articulated in the Natya Shastra, classical music, dance, and architecture; and ethical frameworks centred on concepts such as Dharma, Ahimsa, and collective responsibility.

Indian Knowledge Systems possess an inherent interconnectedness that defines them. Knowledge is viewed as a unified whole that connects the mind, body, society, and nature rather than as isolated disciplinary units. Learning is seen as a transformative process that aims to achieve self-realization, social harmony, and ecological balance, not just accumulation of information. This integrative worldview is in stark contrast to the fragmented curricular structures that dominate many modern education systems and provides valuable insights for interdisciplinary teaching.

INTERDISCIPLINARITY IN INDIAN KNOWLEDGE TRADITIONS

Although interdisciplinarity is often presented as a contemporary educational innovation, it has been deeply rooted in Indian intellectual traditions for a long time. The seamless integration of

classical texts and practices across domains of knowledge is evidenced by their examples. Ayurveda, as an example, integrates biological comprehension, chemical processes, psychological wellbeing, ethical conduct, and environmental awareness into a comprehensive health system. Geometry, astronomy, ecology, aesthetics, and spirituality are the core disciplines in Vastu Shastra that guide architectural design. (Saharia & Mazumdar, 2024)

The exploration of politics, ethics, sociology, leadership, diplomacy, and conflict resolution through complex narratives and moral dilemmas is a key aspect of epics such as the Mahabharata. Shastrartha and Samvada, among other dialogic traditions, encourage debate, reasoning, and perspective-taking, thereby motivating learners to critically engage with diverse viewpoints. (Dr Eknath Mundhe, 2023).

Integration approaches that foster relational and contextual learning involve applying knowledge to real-life situations and ethical considerations. It is encouraged for learners to question, reflect, and synthesize ideas rather than simply memorizing isolated facts. Interdisciplinary education is founded on these qualities and they are still very relevant for contemporary learning environments that aim to address complex global issues.

TWENTY-FIRST-CENTURY SKILLS AND THEIR ALIGNMENT WITH IKS

Global educational frameworks increasingly emphasise the development of twenty-first-century skills, including critical and creative thinking, communication and collaboration, ethical reasoning, adaptability, problem-solving, and environmental and global consciousness. Through pedagogical practices and philosophical foundations Indian Knowledge Systems inherently nurture these competencies. Critical thinking is cultivated through traditions of debate, inquiry, and multiple schools of thought. Creativity is rooted in artistic expression, storytelling coming from generations, philosophical inquiry, and innovation in science and technology. Ethical reasoning is a crucial component of concepts like Dharma and Karma, which emphasize responsibility, justice, and moral accountability. Indigenous ecological practices that promote harmony between humans and nature reflect environmental sustainability. The concept of Vidya focuses on continuous pursuit of knowledge and self-improvement, which is how lifelong learning is emphasised. IKS naturally aligns with skills-based education due to the integration of cognitive, social, emotional, and ethical dimensions of learning. The preparation of learners is not just for professional success, but also

for responsible citizenship and personal fulfilment, which addresses the broader aims of education in the twenty-first century.

NEP 2020: A VISION FOR INTEGRATING INDIAN KNOWLEDGE SYSTEMS

The National Education Policy 2020 offers a comprehensive framework to reimagine education in India. It advocates for an education system that is multidisciplinary and holistic, emphasizing experiential and inquiry-based learning, competency-based assessment, multilingualism, and integrating Indian knowledge traditions across disciplines. NEP 2020 envisions learners who are rooted in Indian culture, but also have global competence, adaptability, and ethical awareness. (Sharma, 2025).

NEP 2020 challenges the Eurocentric curriculum and encourages contextualized learning that reflects India's intellectual heritage by explicitly recognising Indian Knowledge Systems. The policy puts emphasis on flexibility, creativity, and critical thinking, which is closely aligned with the pedagogical principles of IKS. The combination of traditional wisdom and contemporary educational goals offers a unique opportunity to foster meaningful and relevant learning experiences. (World, 2024).

INDIAN KNOWLEDGE SYSTEMS AS A PEDAGOGICAL FRAMEWORK

Teaching and learning practices are transformed when Indian Knowledge Systems are viewed as pedagogy rather than content. IKS include experiential learning through observation, practice, and reflection; dialogic engagement that encourages discussion, debate, and questioning; contextual learning that connects knowledge to lived realities; value-based education that integrates ethics and social responsibility; and the role of the teacher as a facilitator or Guru who guides inquiry rather than transmitting information. (Pathak, n.d.).

These principles have a strong connection to the learner-centered and constructivist approaches advocated by NEP 2020. Active learning, self-reflection, and collaborative inquiry are all promoted in order to enable learners to construct meaningful knowledge and apply it to real-world contexts.

INTERDISCIPLINARY CLASSROOM APPLICATIONS

Various forms can be used to integrate Indian Knowledge Systems into contemporary classrooms in practical ways. Traditional water management systems can be learned through project-based learning that incorporates history, geography, science, and environmental studies. Interdisciplinary units that investigate Ayurveda have the potential to combine biology, chemistry, ethics, and social science. The integration of mathematics, physics, art, and sustainability can be achieved through design thinking that is inspired by indigenous architecture. Debates and simulations that are based on philosophical dialogues have the potential to improve communication, reasoning, and perspective-taking. Bringing epics and cultural narratives to life through technology-enabled storytelling can foster creativity and digital literacy. These approaches foster deep learning, collaboration, and relevance in the real world. They inspire learners to identify connections between disciplines and apply knowledge in an ethical and creative manner.

ROLE OF TECHNOLOGY IN BRIDGING TRADITION AND MODERNITY

Indian knowledge systems can be revitalized and made accessible to contemporary learners with the help of powerful tools offered by technology. Enhancing engagement and understanding can be achieved through the use of digital archives of manuscripts, virtual simulations of traditional practices, WebQuests, inquiry-based platforms, and interactive storytelling tools. The use of technology can bridge tradition and modernity, allowing learners to explore indigenous wisdom through innovative and interactive modes without reducing its philosophical depth when used thoughtfully.

LIFE SKILLS- INTERDISCIPLINARY AND IKS

We know that the proverb 'Man is a social animal' is true. They cannot live without society. His/her primary needs cannot be met without the assistance of others. Every human being desire to live happily in society. To experience happiness in society, we must have good behaviour and ethics, as well as possess certain skills. These skills can help us lead a happy and healthy life in society while also giving pleasure to others.

DEFINITIONS OF LIFE SKILLS EDUCATION

- **UNICEF** - "Life skills as psychological and interpersonal skills that are generally considered important referring to a large group of skills that can help people make informed decisions communicate effectively and develop coping and self-management skills that may help them lead a healthy and productive life".

- **WHO (1999) – "**Life Skills education is designed to facilitate the practice and reinforcement of psychological skills in a culturally and developmentally appropriate way; it contributes to the promotion of personal and social development, the prevention of health and social problems, and the protection of human rights."

- National Education policy 2020 give focus on such as communication, teamwork, resilience, problem solving, decision-making, analytical thinking these life skills that will never develop without integrating different experience coming together from Interdisciplinary knowledge and understanding. . Experimental Learning is the base of national education system 2020 this also demands Interdisciplinary approach. This policy closes the gap between different subjects and subject groups such as science, arts, commerce in achievement of learning outcomes. Classroom interactions or transitions will shift towards competency-based learning with the integration of disciplines only. There is no other way around to bring excellency in outcomes of learning. National Education Policy 2020 gives lot of weightages to life skills, which are very important to day today life. Now it is our duty that to implement these policies effectively and efficiently by integrating NEP2020, IKS and different disciplines with a thoughtful and solution-oriented approach.

INCLUSIVITY THROUGH UDL AND INTERDISCIPLINARY APPROACH:

Inclusivity itself connects the dots of NEP2020, IKS and Interdisciplinary approach. Which will allow all types of learners, to gain their full potential or else maximize their existing potential by benefiting from IKS, NEP2020 interdisciplinary approach. As through this approach Universal Design of Leaning will take place which is only applicable by using IKS, NEP 2020 provisions by blurring and breaking the boundaries of different disciplines. As knowledge integrations empowers learners and learning.

CHALLENGES AND CONSIDERATIONS

Despite its potential, there are obstacles to integrating Indian Knowledge Systems into mainstream education. Without critical engagement, inclusion may become superficial or tokenistic. To implement effectively, it is necessary to have teacher training, curriculum design expertise, and scholarly rigor. The importance of balancing traditional knowledge with scientific inquiry and avoiding cultural homogenization is essential. In order to address these challenges, we need inclusive perspectives, interdisciplinary collaboration, and sustained institutional support.

RECOMMENDATIONS FOR IKS AND INTERDISCIPLINARY EDUCATIONAL APPROACH

- The current global village scenario demands networking at local, national, and international levels. By using this approach, the flow of new ideas, creativity, critical thinking, and creativity can be transferred beyond boundaries. Preventing brain drain may be achieved by learners by moving outside the country for better curriculum and application-based learning. Generating and training a pool of facilitators who can contribute to bringing such reforms to a mass level is the objective of establishing more hum resource labs. In the foundational year of basic school, learners are required to participate in interdisciplinary projects based on their age. It's important that we don't wait until they reach Intermediate and Higher Education. To ensure that the drop-out rate is zero, it is necessary to give more attention. In order to make a significant shift from equality to equity, it's important to bridge the gap between gender inequality. Come together to develop strong and accessible infrastructure with a modern facility. State of Art learning. Call private players to reasonably support government to implement this though provoking and transformational change-oriented vision that certainly will move Indian learners to knowledgeable and risk taker future learners, who will be enough capable to involve themselves in a solution-oriented mindset approach rather just looking at the government to bring reforms.

- The subsequent request will involve reforming assessments and linking learners' learning to employability. Industry, technology, software, market, business, research, defence, transportation, communication, media, etc. collaborate to link curriculum and assessment to enhance job-oriented and profitable outcomes. Discounts and subsidies are necessary for self-help groups, communities, NGOs, and IGOs to establish, promote, and implement an Interdisciplinary approach. Introducing loans that span both short and long terms, with both short and long-term commitments is necessary. Enhancing and promoting an interdisciplinary approach requires the integration of sport, health,

and physical science with Indian traditional medicine, Ayurveda, and other indigenous approaches. It is important for film, theatre, and dance drama to become role models for integrating IKS and Interdisciplinary action approaches.

- Awareness amongst parents, local community, national community, NGOs, Researchers, businessman, business women, Bank and other members of the society to help students to choose various career path. Encourage students-led projects, start-up to come up with new ideas where integration of disciplines played a major role.

- Bridging the gap between digital and non-digital society. By bringing more integration between different media's such as digital, print, virtual, remote, hybrid, social, etc. Successful integration of interdisciplinary education can be achieved through the above-recommended steps, which foster a more flexible, innovative, and research-driven academic environment in alignment with NEP 2020 and IKS.

CONCLUSION

We can clearly map out and gaze the benefits of Indian Knowledge Systems which offer more than just cultural heritage, they offer a complete interdisciplinary pedagogical framework that meets the needs of education in the twenty-first century and fostering learners to use their available intelligence, rather just running behind cognitive ability. Nurturing learners who are skilled, ethical, reflective, and culturally grounded in the NEP 2020 context can be transformed by IKS. To make India's education holistic, inclusive, and future-ready, it is necessary to reconsider IKS as a living pedagogy integrated with modern educational practices and technologies. This approach also honours India's intellectual legacy and equips learners to meaningfully engage with global challenges, while still remaining rooted in timeless wisdom.

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A SWOT ANALYSIS OF THE INTEGRATION OF INDIAN KNOWLEDGE SYSTEMS (IKS) IN SOCIAL STUDIES EDUCATION

Dr. Arti Bhatnagar**

ABSTRACT

The integration of Indian Knowledge Systems (IKS) into Social Studies education presents both opportunities and challenges for reimagining curricula in ways that reflect India's cultural, historical, and philosophical heritage. This paper undertakes a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis to critically evaluate the role of IKS in enriching Social Studies education.

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INTRODUCTION

The current educational discussions in India increasingly emphasize the necessity of incorporating indigenous knowledge systems into mainstream curricula. This acknowledgment is particularly evident in social studies education, where a deep comprehension of cultural heritage and historical viewpoints is crucial for nurturing informed citizens. The National Education Policy 2020 (NEP 2020) promotes the inclusion of Indian Knowledge Traditions (IKT) to enhance cultural understanding, foster identity, and support ethical decision-making among students (Karanwal & Singh, 2023). This shift in teaching methodology aims to connect traditional wisdom with contemporary educational strategies, intending to achieve the comprehensive growth of learners (Karanwal & Singh, 2024).

The integration of Indian Knowledge Systems (IKS) with social studies offers distinct potential and significant problems. In order to objectively review the integration of IKS in social studies education and provide an organised evaluation of its potential and limitations, this study conducts a thorough Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis.

METHODOLOGY

In order to do a thorough SWOT analysis, this inquiry uses a qualitative, analytical technique that synthesizes insights from the body of current scholarly literature. The approach entails a methodical examination of published papers and policy documents pertaining to curriculum integration, social studies instruction, and Indian Knowledge Systems (Mwita, 2022). In order to detect recurrent themes, arguments, and empirical observations pertaining to IKS integration, information was acquired through document analysis and thematic comparison. The results were then subjected to content analysis.

This systematic collection and analysis of information then informed the structured categorization of findings into strengths, weaknesses, opportunities, and threats, providing a robust framework for evaluation.

LITERATURE REVIEW AND THEMATIC ANALYSIS

Historical Context and Evolution of Indian Knowledge Systems in Education

India possesses a rich tradition of education and learning dating back to ancient times, profoundly shaped by the principle of karma. The Vedic period featured student-centered teaching methods, emphasizing listening, understanding, and discussion, which fostered generalization and application of knowledge. Ancient Indian knowledge systems, classified into various sections, have evolved, with growing interest in their relevance for sustainability and human welfare (Vijaya Laxmi K & Dr Shripathi Kalluraya, 2024). These systems were deeply rooted in philosophy, focusing on human welfare across multiple lifetimes rather than solely on current existence (Vijaya Laxmi K & Dr Shripathi Kalluraya, 2024). Notable concepts like Jnana (knowledge) and Ajnana (ignorance) were central, paralleling Vedanta and Vyavahara (practical life) (Vijaya Laxmi K & Dr Shripathi Kalluraya, 2024). However, colonial influences marginalized these traditional systems, propagating Western knowledge and norms (S. A. -, 2024). The NEP 2020 endeavors to revitalize this legacy, incorporating knowledge from ancient India and its contributions into the modern curriculum This policy aims to inspire younger generations to recognize the historical importance of traditional knowledge (S. A. -, 2024).

Theoretical Foundations and Pedagogical Approaches

The theoretical foundations for incorporating IKS into education are consistent with value-based learning and holistic development. A fundamental component of Indian society, the Ashrama system provides a framework for spiritual development and personal progress during four stages of life: Brahmacharya, Grihastha, Vanaprastha, and Sanyasa (n.d.).

Each stage emphasises responsibility and meaningful life while advancing both individual and society growth (n.d.). According to Animesh Das and Prof. Rakesh Rai (2024), ideas from the Bhagavad Gita, such as developing happy emotions and utilising mental resilience, are in line with positive psychology's tenets and provide ageless guidance for stress reduction and overall wellbeing.

In terms of pedagogy, the integration requires striking a balance between conventional knowledge and modern teaching approaches (2024). This comprises methods that integrate competence-based, technological, and action-oriented tactics to support students' cognitive and educational competencies (n.d.-a). The goal of holistic education, which has its roots in ancient literature, art, and culture, is spiritual awakening and comprehensive human growth (2024).

Contemporary Integration of IKS in Social Studies Curriculum

Each stage emphasises responsibility and meaningful life while advancing both individual and society growth (n.d.). Efforts to incorporate IKS into social studies curricula are gaining traction, especially under the NEP 2020 framework (Karanwal & Singh, 2023

The goal is to develop a comprehensive personality rather than just specialised abilities (Karanwal & Singh, 2023). Even with limited resources, schools can create instructional strategies that are suited to students' needs through the practical implementation of curriculum autonomy, as demonstrated by the Merdeka Curriculum (Mardiati et al., 2024). Despite limitations, educators frequently use varied, imaginative, and captivating approaches to optimise curriculum potential. However, the inclusion frequently concentrates on ancient times, possibly ignoring indigenous knowledge from other historical periods Interdisciplinary research, teacher preparation, and cooperation with traditional academics are necessary for effective integration (Karanwal & Singh, 2023).

Socio-Scientific Issues and Holistic Education Practices

Naturally, socio-scientific problems and comprehensive teaching methods are included in the integration of IKS into social studies. Drawing from traditional Indian literature and art, holistic education promotes spiritual awareness and all-encompassing human development (2024). By fusing ancient knowledge with contemporary teaching techniques, this approach enhances the Indian Knowledge Tradition (2024). The goal is to revive India's standing as a "Vishwa Guru" in the world by establishing a strong tradition of Bharatiya Knowledge (2024). This holistic view is centred on ethical instruction, moral values, and cultural understanding, all of which are frequently lacking in modern education (2024). It is believed that developing future teachers with IKS values like wellbeing and compassion is essential to producing successful teachers (Sharma et al., 2024). This includes promoting IKS research in teacher education and employing experiential learning and community engagement (Sharma et al., 2024).

SWOT ANALYSIS OF IKS INTEGRATION IN SOCIAL STUDIES EDUCATION

Different internal and external factors influence the success of integrating Indian Knowledge Systems (IKS) into social studies education, according to a systematic review. This SWOT analysis outlines the advantages of IKS, the risks that could prevent its widespread adoption, the possibilities provided by recent educational reforms, and the weaknesses that could make it difficult to implement. This paradigm offers a distinct viewpoint on the strategic factors necessary for successful integration.

STRENGHTS

Cultural Rootedness and Identity Formation: IKS integration fosters a strong sense of pride and rootedness in Indian culture, which promotes a positive sense of identity among students (Karanwal & Singh, 2023). This cultivation of cultural awareness is a primary benefit.

Holistic Development: Ancient Indian education systems focused on cognitive, affective, and psychomotor domains, emphasizing higher-order learning and holistic personality development Karanwal & Singh, 2023). This approach contrasts with modern systems often centered on specialized skills.

Ethical and Moral Foundations: IKS offers strong ethical frameworks and moral values, drawing from texts like the Bhagavad Gita, which can guide ethical decision-making and stress management (Animesh Das & Prof. Rakesh Rai, 2024)(Karanwal & Singh, 2023). This addresses a perceived lack of moral education in contemporary curricula (2024).

Timeless Wisdom and Resilience: The wisdom embedded in IKS, such as the Ashrama system, provides enduring frameworks for personal growth and resilience applicable across generations (n.d.).

WEAKNESSES

Limited Teacher Training and Expertise: One major issue is the lack of teachers with the necessary training to integrate IKS content and pedagogical approaches (Karanwal & Singh, 2023). Effective implementation is impacted by this.

Curriculum Design and Resource Development: It is still difficult to create well-thought-out curricula and suitable resources that smoothly incorporate IKS into current social studies frameworks (Karanwal & Singh, 2023). Accessible, high-quality materials are needed. Risk of Superficial Integration: IKS integration could become superficial, reduced to cultural tales rather than meaningful philosophical or historical investigation, if there is a lack of profound comprehension and dedication.

Perceived Irrelevance by Some Stakeholders: Some educators or parents may oppose modern educational paradigms because they believe that knowledge from antiquity is less applicable to today's global issues.

Standardisation Challenges: Developing a standardised curriculum that respects regional differences while preserving national coherence is challenging due to the varied and complex character of different IKS traditions.

OPPORTUNITIES

The National Education Policy 2020 (NEP 2020) provides institutional support and a clear policy directive for the inclusion of IKT in the curriculum (Karanwal & Singh, 2023). This creates a favourable environment for implementation.

Digital Platforms and Online Courses: As digital learning platforms become more common, they provide a scalable way to create and distribute IKT courses to a larger student body (Karanwal & Singh, 2023). This is supported by the shift to online modalities, which has been accelerated by events such as the COVID-19 pandemic (Khan et al., 2024).

Interdisciplinary Research and Collaboration: Collaboration with traditional scholars, IKS experts, and interdisciplinary research can enrich curriculum content and pedagogical approaches (Karanwal & Singh, 2023) (Sharma et al., 2024). This encourages creativity and complexity in instructional materials.

Global Interest in Holistic Education: Alternative knowledge systems and holistic education are becoming more and more popular worldwide, which makes IKS a useful addition to the global conversation about education.

Promoting Critical Thinking: Students' analytical abilities can be enhanced by interacting with a variety of knowledge traditions, which can stimulate critical thinking about various viewpoints and epistemologies.

THREATS

Possibility of Misinterpretation or Politicisation: IKS may be misread, oversimplified, or politicised if it is not treated with scholarly rigor, which could result in a presentation that is limited or biased).

Resource Constraints: The fair implementation of IKS curricula may be hampered by a lack of resources, infrastructure, and access to high-quality educational materials, especially in rural or undeveloped areas (Karanwal & Singh, 2023).

DISCUSSION

The educational landscape in India could undergo significant change as a result of the incorporation of Indian Knowledge Systems into social studies instruction. The thorough SWOT analysis reveals that although IKS has significant advantages in terms of cultural identity and holistic development, its effective use depends on resolving internal flaws and avoiding outside threats. Although the NEP 2020 lays a solid foundation for policy, achieving its goals still depends

heavily on the practical aspects of curriculum design, teacher preparation, and resource allocation. To guarantee that IKS enhances education without giving in to oversimplification or politicisation, a fair and academic approach is crucial.

IMPLICATIONS FOR CURRICULUM DEVELOPMENT AND PEDAGOGY

Curriculum development for IKS integration requires a multidisciplinary approach, drawing lessons from ancient educational practices that fostered higher-order thinking. Contemporary curricula can adopt instructional strategies like listening, understanding, and discussion, mirroring Vedic teaching methods. Pedagogically, this implies a shift towards learner-centric models that cultivate not only academic knowledge but also ethical values and cultural appreciation (2024). Incorporating positive psychology principles from texts like the Bhagavad Gita can enhance student well-being and resilience (Animesh Das & Prof. Rakesh Rai, 2024). The focus should extend beyond rote learning to foster a panoramic development of human beings, integrating traditional wisdom with modern teaching methodologies (2024). This holistic perspective aligns with global educational trends valuing comprehensive personal growth alongside academic achievement.

A multidisciplinary approach is needed to build curricula for IKS integration, taking inspiration from traditional teaching methods that promoted higher-order thinking. Similar to Vedic teaching approaches, modern curriculum might use instructional strategies such as listening, comprehension, and conversation. This suggests a change in pedagogy towards learner-centric approaches that foster not only academic knowledge but also cultural appreciation and ethical values (2024). Students' resilience and general well-being can be improved by incorporating positive psychology concepts from books like the Bhagavad Gita (Animesh Das & Prof. Rakesh Rai, 2024). By combining ancient knowledge with contemporary teaching techniques, the emphasis should go beyond memorisation to promote a whole human growth (2024). This all-encompassing viewpoint is consistent with international educational trends that value both academic success and holistic personal development.

CHALLENGES AND RECOMMENDATIONS FOR EFFECTIVE INTEGRATION

Inadequate teacher preparation, a dearth of well-crafted curriculum resources, and possible opposition from stakeholders are obstacles to IKS integration (Karanwal & Singh, 2023). Several suggestions are made to address these:

1. Comprehensive Teacher Training Programs: Provide educators with specialised professional development courses that emphasise IKS material, pedagogical approaches, and culturally sensitive teaching techniques (Karanwal & Singh, 2023).

2. Creation of Superior Resources: Make age-appropriate, interesting, and easily available textbooks, digital modules, and supplemental resources that truly reflect IKS. Authenticity requires cooperation with traditional scholars (Karanwal & Singh, 2023).

3. Interdisciplinary Curriculum Design: To strengthen learning and show wider applicability, encourage an interdisciplinary approach where IKS themes are incorporated throughout topics, not simply social studies.

4. Community Engagement: To create authentic learning experiences, including local communities and IKS practitioners in curriculum development and classroom activities.

5. Pilot Programs and Feedback Mechanisms: To test new curricula and get input for iterative improvement, implement pilot programs in a variety of educational contexts.

6. Strict Evaluation Frameworks: To evaluate how IKS integration affects student learning, cultural identity, and ethical growth, establish precise measurements and techniques.

IMPACT ON INCLUSIVITY, TEACHER PREPARATION, AND STUDENT OUTCOMES

By acknowledging and appreciating varied cultural history, integrating IKS can greatly improve inclusion and create a more equal learning environment. To guarantee true inclusion, however, attention must be taken to incorporate a wide range of indigenous knowledge rather than just ancient writings (S. A. -, 2024). IKS provides a framework for teacher preparation that fosters the development of holistic educators who exemplify the ideals of knowledge, compassion, and well-being (Sharma et al., 2024). This necessitates the integration of IKS principles through community participation and experiential learning in teacher education programs (Sharma et al., 2024).

Improved cultural literacy, greater identity construction, improved ethical reasoning, and a more thorough comprehension of societal institutions are possible student outcomes (Karanwal & Singh, 2023) (2024).

According to Animesh Das and Prof. Rakesh Rai (2024), the holistic development method can provide pupils with resilience and constructive coping mechanisms derived from traditional wisdom for contemporary difficulties.

CONCLUSION

The incorporation of Indian Knowledge Systems into social studies education offers a crucial chance to enhance the educational process, encourage cultural pride, and support students' overall growth. The SWOT analysis shows that although IKS's intrinsic strengths and helpful policy frameworks like NEP 2020 provide a solid basis, there are still a lot of obstacles to overcome. These include the requirement for thorough teacher preparation, carefully thought-out curricula, and sufficient funding. It takes a coordinated, academic, and inclusive effort to overcome flaws like possible superficiality and navigate risks like politicisation. The Indian educational system may successfully capitalise on its rich intellectual legacy by deliberately addressing these elements, producing a generation that is ethically aware, entrenched in its culture, and prepared for the complexity of today's world.

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AI AND DIGITAL LEARNING PLATFORMS AS TOOLS FOR DEMOCRATIZING INDIAN KNOWLEDGE SYSTEMS IN TEACHER EDUCATION

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ABSTRACT

The Indian Knowledge System (IKS) is a rich and versatile intellectual tradition of Indian philosophy, science, pedagogy, ethics, ecology, and comprehensive human approaches. The National Education Policy (NEP) 2020 in recent years has placed a greater focus on the incorporation of IKS into modern education especially teacher education to help in the production of culturally oriented and future oriented educators. At the same time, the rapid development of artificial intelligence (AI) and online education tools has changed the ways of creating, spreading, and acquiring knowledge. The paper will discuss the use of AI and digital platforms as an effective means of democratization of India Knowledge Systems in teacher education. The study employs a qualitative and conceptual research design and is based on secondary sources, policy papers, scholarly literature, and the choice of case examples of digital projects concerning IKS. The paper addresses the pedagogical promise of AI-based applications like adaptive learning systems, intelligent tutoring, MOOCs, and digital repositories in addressing the issues of IKS accessibility, inclusivity, and scalability. It critically examines ethical, cultural, and epistemological issues that are involved in the process of digitizing indigenous knowledge traditions too. The evidence indicates that AI and digital platforms have great potential to be used to bridge tradition and modernity, but to succeed, they need to be designed in a culturally sensitive way, under an ethical governing framework, and their use by the teacher requires preparation. The paper will conclude that the strategic aligned digital interventions have a transformative role to play in inculcating IKS in teacher learning and knowledge democratizing educational systems, which enhances educational equity, cultural continuity, and democratization of knowledge in India.

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INTRODUCTION

Indian Knowledge Systems (IKS) are a pluralistic form of knowledge which has been built throughout centuries, as a result of philosophical inquiry, empirical data, and experience. Such systems include various areas like education, medicine, mathematics, astronomy, ecology, ethics, linguistics and aesthetics. The importance of traditional pedagogical practices (dialogue, storytelling, contemplation, and experiential learning) has traditionally focused on the holistic development, moral values, and social responsibility. Nevertheless, colonial educational systems and the modernization development that followed the attainment of independence tended to depress the aspects of indigenous knowledge, favoring Western knowledge in institutional education systems.

The rediscovery and reintegration of IKS into mainstream education has been revived both as policy and as an academic concern in recent years. Included in the National Education Policy (NEP) 2020 are explicit proposals in favour of the introduction of Indian knowledge traditions in curricula and teacher education programmes. The teachers are considered to be the major players in this transformation since the training process defines the manner in which knowledge is interpreted, contextualized, and passed onto the learners. Nonetheless, the successful implementation of IKS is hampered by lack of resources, imbalance in regions, language barriers, and teacher ill will.

Simultaneously with these changes, AI and online learning platforms have become the new forces that transform the education system worldwide. AI tools, web-based applications and open e-learning resources have increased access to knowledge, personalized education, and made educational content feasible to be distributed on a large scale. Digital projects like MOOCs, virtual repositories, and online teacher training programmes have proven in the Indian context to be able to democratize education that is not limited by geographical and socio-economic boundaries.

The thesis of this paper is that AI and digital learning systems could be key facilitators in the democratization of Indian Knowledge Systems in teacher education. When these technologies are used to balance tradition and modernity, IKS can be more accessible, relevant and inclusive without losing its philosophical complexity and cultural authenticity. This intersection is discussed in the study conceptually and analytically.

OBJECTIVES OF THE STUDY

The particular objectives of this research include:

- To explore the implication of Indian Knowledge Systems to modern teacher education.
- In order to examine the importance of artificial intelligence and digital learning platforms in knowledge dissemination.
- To address how AI-based digital technology can make the Indian Knowledge Systems more democratic.
- To determine pedagogical openings and problems associated with the integration of IKS using the digital platforms.
- To suggest the ideas on how to ethically and efficiently integrate IKS in the teacher education with AI-based technologies.

RESEARCH QUESTIONS

The research questions of the study are:

- What role can artificial intelligence and digital learning systems play in the spread of Indian Knowledge Systems in the teaching of teachers?
- How can AI-based educational technologies promote the accessibility and inclusivity of IKS
- Which pedagogic advantages and disadvantages does the digitalization of Indian Knowledge Systems hold?
- What are the ethical and cultural issues that are involved with the use of AI to transmit indigenous knowledge?
- What are the ways of teacher education programmes to strategically incorporate AI-based platforms with NEP 2020 objectives?

METHODOLOGY

The study has a qualitative, conceptual and descriptive approach. The research is a secondary data acquisition made through academic journals, books, policy documents, conference proceedings, and other reliable digital materials on the areas of Indian Knowledge Systems, artificial intelligence in education, and teacher education. The important policy frameworks especially the

National Education Policy 2020 are examined to put the relevance of digital technologies in the educational reform in context.

An analysis based on a thematic approach is used to generalize the available literature and find common trends, which are connected with digital dissemination, democratization, and pedagogical change. Furthermore, certain examples of digital platforms and initiatives connected with IKS are chosen to provide conceptual arguments to support them. This approach is applicable in the investigation of new areas of intersections between technology and indigenous knowledge systems where there are very little empirical data.

LITERATURE REVIEW

Indian Knowledge Systems (IKS) is a discourse that has received renewed scholarly and policy interest over the last several decades especially as a part of decolonizing education and reclaiming indigenous epistemologies. The Indian knowledge traditions are many-sided not only in philosophy, pedagogy, science, mathematics, medicine, ecology, ethics, and aesthetics but also have centuries-long experience of learning and philosophical reflection. The works of scholars like Radhakrishnan (1951) and Aurobindo (1990) point out that the Indian epistemology is by nature holistic with the integration of cognitive, moral and spiritual aspects of learning. In contrast to the models of reductionist knowledge, IKS pre-empts values-based learning, self-realization, and social responsibility.

Teacher education takes centre stage in the process of passing and redefining the knowledge systems. Kumar (2018) asserts that the teachers can also be seen as cultural brokers and they are the ones to influence the contextualization and delivery of knowledge to students. Research conducted on culturally responsive pedagogy emphasizes that to be socially relevant teacher education needs to be based on local knowledge, cultural conditioning, and indigenous view. Nevertheless, the colonial history and the western-centric curricula have traditionally marginalized IKS in the formal teacher education programs, and it has created a gap between the IKS traditions and pedagogical practices in the classroom.

The National Education Policy (NEP) 2020 is the latest policy aim which suggests a major change as it extensively promotes the introduction of Indian Knowledge Systems into all educational levels, even teacher education. The policy focuses on multilingualism, experiential learning,

ethical reasoning and incorporation of traditional knowledge in the curricula (Government of India, 2020). Researchers understand NEP 2020 as a chance to re-indigenize epistemologies and at the same time be open to technological innovation. Nevertheless, the realisation of these goals continues to be unequal because of the infrastructural limitations, insufficiency in the preparedness of teachers, and unavailability of learning materials.

Simultaneously with the renewed enthusiasm surrounding IKS, there has been the emergence of a new force in the education sector, namely, artificial intelligence (AI) and online learning platforms. The most common AI-related tools in education relate to personalized learning, adaptive assessment, intelligent tutoring systems, and data-driven decision-making (Holmes et al., 2019). In their systematic review, Zawacki-Richter et al. (2019) emphasize that AI applications can be used in higher education to increase the level of engagement in learning, scale, and efficiency, especially in resource-constrained conditions. Online platforms like MOOCs, learning management systems and open educational repositories have continued to increase access to education not only in geographical boundaries but also in socio-economic boundaries.

Digital technologies that are applied in teacher education have been discussed based on models like Technological Pedagogical Content Knowledge (TPACK), which focuses on the interdependence of technology, pedagogy and subject matter knowledge (Mishra and Koehler, 2006). It is especially applicable to incorporating IKS with the use of digital means, because it emphasizes the necessity of pedagogically informed application of technology instead of digitalizing content per se. The research indicates that teacher education that has been facilitated by technology can help in reflective practice, collaborative learning and lifelong learning.

The new literature on the meeting of technology and indigenous knowledge systems points to the opportunities and issues. The digital platform can be used as a means of protecting the endangered knowledge traditions, support intergenerational knowledge transmission, and global distribution (UNESCO, 2021). Multilingual AI-based tools, digital storytelling, and virtual simulation are in line with the traditional Indian pedagogical approaches, i.e., oral narration, dialogue, and experiential learning. Simultaneously, researchers warn of the dangers of decontextualization, cultural appropriation and epistemic dilution in case indigenous knowledge is digitized (Smith, 2012).

Ethical issues hold a decisive role in the debates on AI-mediated knowledge sharing. AI systems are characterized by data, algorithms, and institutional interests, potentially prioritizing the dominant narratives and silencing the local voices. This brings issues of ownership, authenticity and community approval in the context of IKS. UNESCO (2021) states that human-oriented and morally regulated AI systems, which observe cultural diversity and knowledge sovereignty, are needed.

Although there has been an increasing body of research about AI and its application in education, and recent research has rediscovered the Indian Knowledge Systems, very little work has been done to explicitly explore their intersection in teacher education. Literature tends to consider technology and indigenous knowledge as two distinct entities and thus, there is a conceptual and practical gap in comprehending how AI-enabled platforms can help democratize IKS in pedagogically relevant and culturally sensitive manners. This disconnect is especially enormous in the field of teacher education, in which the workers of the future have to be prepared to make their way across both the wisdom of tradition and the technological devices of modernity.

To fill this gap, the current research paper makes contributions to the literature in the form of a conceptual analysis of how AI and digital learning platforms can serve as facilitators of knowledge democratization without compromising the epistemological quality of Indian Knowledge Systems. The study builds on the current research and provides a basis of future empirical studies by placing the discussion in a broader context and policy frameworks like NEP 2020.

FINDINGS

These are the main findings that can be made during the analysis:

First, AI and digital learning platforms will make the availability of Indian Knowledge Systems much higher. Learners with different socio-economic and regional background can interact with IKS with the help of online repositories, multilingual material, and adaptive learning systems.

Second, personalization based on AI contributes to the differentiated learning of teachers. The intelligent tutoring systems and recommendation algorithms can adjust the content in Indian philosophy, pedagogy, and ethics to specific learning requirements and background knowledge.

Third, digital platforms promote inter-disciplinary/experiential learning. The use of multimedia tools, virtual games, and digital narratives allows the adoption of innovative pedagogical strategies that can be incorporated into the conventional teaching activities of the Indians.

Fourth, there are difficulties in the regard of cultural authenticity and ethical application. Digitization of IKS is fraught with a danger that it will be simplified, decontextualized and commodified without scholarly direction and community involvement.

DISCUSSION

The results indicate that AI and online platform has massive potential in democratizing Indian Knowledge Systems, especially in teacher training. Technology can help to implement the vision of the NEP 2020 of inclusive and culturally-based education by breaking the obstacles of geography, language, and institutional accessibility. Nonetheless, the implementation of AI should be instructed and regulated.

Teacher educators are also very instrumental in mediating between technology and tradition. In the absence of proper training, digital tools can only be minimized to content delivery tools instead of being improved as a pedagogical tool. Moreover, IKS epistemological bases require active reflection as opposed to passive consumption, and to design instructional material, it is required to pay attention to this point.

The paper highlights the importance of policy frameworks that put an emphasis on open access, community participation, and ethical governance of AI. Educators, technologists, and scholars of IKS should collaborate in order to make sure that digital dissemination promotes and not erodes indigenous knowledge traditions.

POLICY RECOMMENDATIONS

Digital Frameworks of Indian Knowledge Systems into Institutions.

Indian Knowledge Systems (IKS) should be formally introduced in the curriculum of teacher education institutions by the means of formally structured digital structures accompanied by the use of artificial intelligence. Repositories, with authenticated IKS material, of philosophy, pedagogy, ethics, science and native practices, should be created, and be available through open digital platforms, to provide consistency and scholarly viability.

Artificial Intelligence Teacher Capacity Building Programmes.

To enable the effective sharing of IKS via digital platforms, teacher educators need to be built over time. The policymakers are to enforce AI-supported professional development programmes that will be based on digital pedagogy, culturally responsive teaching, and ethical use of technology. These programmes are to be incorporated in pre-service and in-service teacher education.

The Digital Content Development Multilingual and Inclusive.

To make it more democratic, AI-based platforms need to be used to promote the dissemination of IKS material through multiple languages, especially regional and indigenous. The policies must focus on inclusive design to meet the needs of learners with varied socio-economic, geographic, and lingual endowments to mitigate digital and cultural marginalization.

Ethical Responsibility and Cultural Protection of AI Application.

There should be definite ethical principles that would control the digitalization and AI-driven distribution of Indian Knowledge Systems. Protection against cultures appropriation, commodification of knowledge and distortion of epistemology should be provided by policymakers. Digital IKS initiatives should include mandatory participation of the community, scholarly validation, and clear AI algorithms.

Combination of IKS-Based MOOCs and Online Teacher Education.

Programmes focused on Indian Knowledge Systems MOOCs and online certification programmes should be encouraged by government agencies and higher education institutions. Such programmes are supposed to combine conventional pedagogical techniques, i.e., storytelling, dialogue and reflective inquiry with AI-facilitated personalization and evaluation tools.

NEP 2020 and Teacher Education Regulatory Bodies alignment.

Universities and regulatory bodies (e.g., NCTE) need to adjust the accreditation and curriculum requirements to NEP 2020 by urging the use of AI-assisted IKS integration in teacher education. It should also offer incentives to institutions that are responsible in integrating indigenous knowledge with digital learning technologies.

Research and Collaboration Investment.

The Interdisciplinary research on the pedagogical, ethical, and technological aspects of AI-enabled spread of Indian Knowledge Systems should be supported by policy makers. Sustainable and context-sensitive innovation can be developed by collaborative programs with educators, technologists, philosophers, and holders of indigenous knowledge.

CONCLUSION

Digital learning platforms and artificial intelligence provide potent opportunities to the democratization of Indian Knowledge Systems when applied to teacher education. Such technologies can close the gap between tradition and modernity, and thus make IKS accessible, relevant, and sustainable when it is related to the principles of pedagogy and cultural values. Nonetheless, there has to be technological integration that is supported by ethical protection, capacity building in teachers, and policy assistance. The future of Ind teacher education.

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THE PROMISES AND CHALLENGES OF GENERATIVE ARTIFICIAL INTELLIGENCE FOR IN-SERVICE TEACHERS: A SYSTEMATIC REVIEW

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ABSTRACT

The rapid advancement in the field of Generative Artificial Intelligence (GAI) has transformed the educational settings by reshaping our teaching and learning practices. The in-service teacher educators occupy the most important role in integrating AI as they are the facilitators for students in classrooms of schools and universities. Therefore, their perception, readiness and professional development are very important aspects for the successful adoption of AI. This study follows a PRISMA methodology and has analysed approximately 32 studies related to in-service teacher educators. This review highlights opportunities, challenges and professional development with respect to in-service teacher educators and Generative AI. This research work focuses on the need for teacher training programmes for teachers to develop them professionally with AI literacy, AI awareness, AI skills, technical knowledge, digital literacy, competency and self-efficacy. The study furthermore highlights the significance of continued research and evidence to fully understand the integration of Generative AI in the educational contexts to make the teaching-learning process more efficient and effective for enhanced student outcomes.

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INTRODUCTION

The advancement of generative artificial intelligence in Education 4.0 has reshaped the education roadmap with technologies like ChatGPT, DALL-E, Gemini and other large language models (Feuerriege et al. 2024; Su & Yang 2023). This technology integration in future classrooms in the form of personalised learning, automated assessment, immediate feedback mechanisms, and

intelligent tutoring systems has enhanced the teaching-learning scenario in the educational settings (Lee & Song, 2024). Due to this technological advancement, the role of teachers has become increasingly crucial as they play a pivotal role in disseminating the pedagogical innovations guided by artificial intelligence (Volker, 2023). Therefore, this study aims to investigate this changing landscape for in-service teachers who act as mediators between technological innovations and actual classroom practices (Kofinas et al. 2025). The study explores the opportunities for in-service teachers, some challenges and concerns and the need for professional development and teacher training for effective AI integration in future classrooms (Dakakni & Safa 2023).. By analysis and synthesis of in-service teachers' related studies, this paper aims to investigate the following

RESEARCH QUESTIONS (RQ)

RQ1: What are the opportunities and challenges of using generative AI for in-service teachers?

RQ2: How can professional development of in-service teachers help in using generative AI effectively?

This review will offer valuable insights for educators, policymakers and researchers to design strategies for effective integration of generative AI in the educational landscape.

METHODOLOGY

The systematic review follows the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) framework (Page et al., 2021) and selects relevant studies in a structured way. The goal of this study was to identify research related to Generative AI and In-service teachers, mainly focusing on their opportunities, challenges and the need for professional development.

SEARCH STRATEGY AND STUDY SELECTION

To study relevant literature, a structured advanced search query was used in the SCOPUS, Web of Science, Google Scholar and IEEE Xplore databases. The following keywords and Boolean operators were applied:

("Artificial Intelligence" OR "Generative AI" OR "ChatGPT")

AND ("Teacher" OR "In-service Teacher" OR "Teacher Educator" OR "Educators" OR "Faculty") AND ("Perception" OR "Attitude" OR "Acceptance" OR "Competency" OR
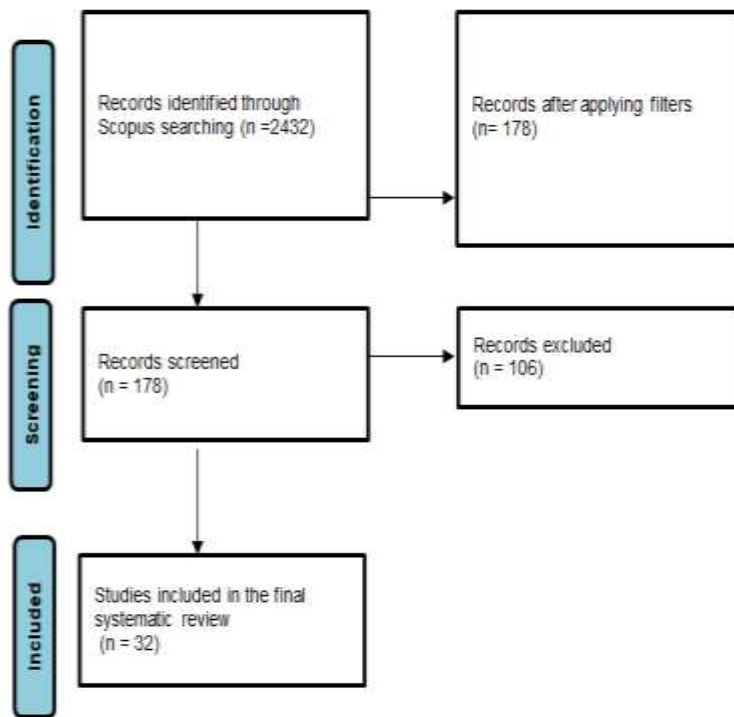
Fig. 1.1 PRISMA Flow Diagram

"Professional Development" OR "Teacher Training" OR "Teacher Education")

AND ("Opportunities" OR "Challenges" OR "Barriers" OR "Concerns")

This search initially retrieved 2432 documents. To further refine the results, the following inclusion criteria were used:

1. **Publication Type**: Articles and reviews only
2. **Language**: English
3. **Publication Period**: 2015–2025
4. **Subject Areas**: Social Sciences, Computer Science, Arts and Humanities
5. **Access Type**: Open Access

When these filters were applied, the number of relevant studies was reduced to 178 documents. In the second step, a title and abstract screening was done to remove irrelevant studies. This reduced the final number of documents to approximately 32, as shown in Figure 1 below:

ANALYSIS OF THE STUDIES REVIEWED

RQ1: What are the opportunities and challenges of using Generative AI for in-service teachers?

Opportunities for In-Service Teachers

Kim et al. (2023), in their study highlighted that many teachers were willing to use Generative AI as it helps in personalised learning, provides immediate feedback mechanisms, automates assessment and reduces administrative workload. Celik et al. (2022) studied teachers' use of artificial intelligence and concluded that teachers have various roles in the process of AI development. They act as models for AI algorithm training and AI development participants to check the accuracy of AI assessment features (Holmes et al. 2023). Teachers have shown a positive inclination towards the benefits of AI in improved planning of lessons, intervention for feedback and assessment by automated scoring. Mananay, (2024) emphasised on the adaptive systems of AI and individualised feedback for teachers. Kim et al. (2023), in their study emphasised that the incorporation of AI in educational settings improved the pedagogical content knowledge of teachers as well as improved the learning outcomes of students. Generative AI integration in pedagogical practices is a way that supplements the teaching and learning process rather than replacing human expertise and interaction (Celik et al., 2022). This human-centred framework with the intersection of AI and humans would make the education process more inclusive and equitable. (Gašević et al. 2023; Xu, 2019). The AI ecosystem can provide learning opportunities for all (Calatayud et al. 2021).

Challenges for In-Service Teachers

Kim et al. (2023) also studied different challenges of AI including decreasing socialisation in school and overdependence on AI which could erode the human-teacher relationship. Fitzgerald et al. (2015) in his study highlighted another challenge as the lack of reliability in the AI algorithm system because it fails to address the complex nature of texts when incorporated with images.

Hence, it has to be improved by teachers who can evaluate the AI-based automated system for writing and evaluation (Qin et al., 2020). Lu et al. (2019) stressed that validity is more important than reliability in the case of AI assessment and evaluation processes, as their scoring systems sometimes evaluate the performance of students incorrectly. Other studies emphasised that AI-based behaviour detection systems cannot process different languages, so it is very difficult to use this technology in different educational settings (Nikiforos et al., 2020). Some other limitations for the integration of AI technology include inadequate technology integration knowledge of teachers (Chiu & Chai, 2020) and inefficient technical infrastructural capacity in educational institutions. Another challenge reported is the slow mechanism of the AI-based feedback system, which sometimes leads to boredom for teachers in the classrooms. Moreover, AI systems are not able to give adequate feedback according to the students' requirements every time. Therefore, AI systems are not able to meet the needs and requirements of teaching and learning in the classroom scenario. Schiff (2020) studied that most educators have limited knowledge about the understanding and pedagogies of AI in the teaching and learning processes and they also have misinformation about AI which makes them skeptical about the usage of AI.

RQ2: How can professional development of in-service teachers help in using Generative AI effectively?

Professional Development of In-Service Teachers

Sadykova and Kayumova (2024) investigated that there must be proper implementation of professional development and teacher training programmes for AI awareness and AI skill building among teachers to prepare them for inclusive practices and sustainable development. Kong et al. in their study explored the importance of AI for the professional development of in-service teachers. The study concluded that AI can enhance the self-efficacy of teachers and enhance student learning outcomes. Kim & Kwon (2023) highlighted that the pedagogical content knowledge of teachers can be enhanced with proper professional development programmes for AI in education. Park & Kwon (2023) also emphasised the need for in-service teacher training programmes to enhance teachers' self-efficacy. Another important study describes the role of School Support Resources for in-service teachers for AI integration in their teaching and learning. So there is a continued need for professional development programmes as well as collaborative

learning to improve teachers' skills in the educational settings. Moreover, it studies the important role of policies in supporting AI integration in the classroom and the ethical implications of AI usage in the process of teaching and learning (Molefi et al. 2024).

DISCUSSION, REFLECTIONS AND SUGGESTIONS

There is an immense need for generative AI teaching training programmes to increase AI adoption among educators (Hazzan-Bishara et al. 2025). The teachers must be well prepared and have adequate knowledge of the transformative potential of AI in K-12 classroom settings. There is a need to develop teachers' knowledge and skills for AI integration in education so that our students can be AI savvy and integrate AI in their learning process (Antonenko & Abramowitz 2023). Therefore, there is an immense need of teacher training programmes to unleash the full potential of AI to enhance teaching and learning outcomes. Lee et al. (2024) in their study highlighted the need to create field-friendly AI teaching-learning settings for teachers as well as students. There are several limitations as far as AI is concerned, such as inefficient reliability, validity, technical infrastructure and its implementation in different settings (Khan et al. 2025). Therefore, further research is important to reduce the limitations of AI. The AI systems can enhance teachers' pedagogical and technical knowledge for addressing diverse learning which could contribute to the quality of education but it is yet to be accomplished. Therefore, multidisciplinary research and collaborations among different stakeholders such as AI trainers, pedagogical experts, technical experts, teachers as well as students are very important (Celik et al. 2022).

CONCLUSION

In conclusion, this systematic review has emphasised the integration of Generative AI in enhancing the teaching-learning process but there are few challenges that need to be addressed to unleash the full potential of Generative AI in education. Moreover, the number of studies on AI and in-service teachers has been increasing in the last few years, so there is a need to study more about AI use for teachers. As AI has increased in popularity in education, the focus on AI use in teaching as well as the learning processes and enhancing students' outcomes has become crucial. So the need for teacher training in pedagogical and technical knowledge and professional development of teachers is essential (Yilmaz & Yilmaz, 2023). The current study investigates the opportunities, challenges and the role of professional development in enhancing the technological integration in

the classroom settings. Future research work can explore the aspects of AI integration for pre-service teachers and the role of AI-based education in the teaching-learning process of future classrooms. In summary, this systematic review indicates that Generative AI has the immense potential to provide transformative platforms for in-service teachers but it also has some limitations for classroom settings (Yu & Yu, 2023). This paper highlights the issues that need to be addressed, like lack of reliability, validity, high cost of infrastructure building, erosion of the very human student connection, inadequate technical knowledge etc. This research work focuses on the need for teacher training programmes for the teachers to develop them professionally with AI literacy, AI awareness, AI skills technical knowledge, digital literacy, competency and self-efficacy (Qadir et al. 2022). The study furthermore highlights the significance of continued research and evidence to fully understand the integration of Generative AI in educational contexts to make the teaching-learning process more efficient and effective for enhanced student outcomes.

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INTEGRATING TRADITIONAL TEACHING–LEARNING PRACTICES IN ENGLISH AND PHYSICS EDUCATION: A MULTILINGUAL PERSPECTIVE UNDER NEP 2020

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ABSTRACT

Traditional teaching-learning practices such as dialogue, storytelling, and inquiry-based methods continue to hold significant pedagogical relevance across disciplines, particularly in English language and physics education within multilingual classrooms, as emphasised by the National Education Policy (NEP) 2020. In English language education, dialogue-based pedagogy enhances communicative competence and supports language acquisition through meaningful interaction, while storytelling aids vocabulary development, narrative skills, and cultural linkage. In Physics education, these traditional practices contribute to learners' conceptual understanding of natural laws and scientific principles. Inquiry-based methods promote observation, questioning, experimentation, and critical thinking, leading to deeper conceptual clarity and learner autonomy. This paper critically examines the integration of traditional pedagogical approaches in English and Physics education through a multilingual lens, highlighting their relevance, applicability, challenges, and alignment with NEP 2020. The study argues that revitalizing traditional practices can contribute significantly to holistic, inclusive, and learner-centered education.

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INTRODUCTION

Education systems worldwide are undergoing rapid transformation in response to globalization, technological advancement, and changing learner needs. While modern pedagogical tools and digital platforms have gained prominence, traditional teaching–learning practices continue to remain central to effective classroom instruction. Dialogue, storytelling, and inquiry-based learning have historically served as powerful tools for knowledge construction and transmission.

In the Indian context, classrooms are inherently multilingual, posing unique challenges and opportunities for teaching and learning. The National Education Policy (NEP) 2020 emphasizes experiential learning, multilingualism, conceptual understanding, and learner autonomy. Against this backdrop, revisiting traditional pedagogical practices becomes essential, particularly in subjects like English and Physics, which demand both conceptual clarity and communicative competence.

This paper explores the relevance and application of traditional teaching–learning practices in English and Physics education within multilingual classrooms and examines their alignment with the vision and objectives of NEP 2020.

REVIEW OF RELATED LITERATURE

Previous studies highlight the enduring relevance of traditional pedagogical approaches in contemporary education. Vygotsky's socio-cultural theory emphasizes the role of dialogue and social interaction in cognitive development. Bruner underscores the importance of narrative and discovery-based learning in fostering deeper understanding.

Research in English language education suggests that dialogue-based and storytelling approaches enhance learner engagement, language proficiency, and cultural awareness. Similarly, studies in science education indicate that inquiry-based learning promotes scientific reasoning, conceptual clarity, and learner motivation. However, limited research has examined the interdisciplinary application of these practices in multilingual contexts under NEP 2020, thereby establishing the need for the present study.

TRADITIONAL TEACHING–LEARNING PRACTICES: CONCEPTUAL FRAMEWORK

Traditional teaching–learning practices focus on learner participation, interaction, and experiential understanding. Dialogue-based learning encourages meaningful communication and collaborative knowledge construction. Storytelling connects abstract concepts with lived experiences and cultural narratives. Inquiry-based learning emphasizes questioning, exploration, and discovery.

These practices collectively contribute to holistic development by addressing cognitive, linguistic, emotional, and social dimensions of learning. NEP 2020 recognizes such approaches as essential for nurturing critical thinking, creativity, and lifelong learning skills.

Dialogue-Based Pedagogy in English and Physics Education

In English language classrooms, dialogue-based pedagogy facilitates authentic language use through discussions, debates, role-plays, and interactive questioning. Such practices enhance listening and speaking skills, promote confidence, and support language acquisition in multilingual settings.

In Physics education, dialogue-based teaching enables learners to articulate scientific ideas, clarify misconceptions, and engage in logical reasoning. Classroom discussions and guided questioning help learners link theoretical concepts with real-life phenomena, thereby deepening conceptual understanding.

Role of Storytelling in Teaching English and Physics

Storytelling plays a vital role in English education by enhancing vocabulary development, narrative competence, imagination, and cultural sensitivity. Stories provide meaningful contexts for language use and foster emotional engagement, leading to better comprehension and retention. In Physics education, storytelling can be employed to narrate the historical development of scientific concepts, discoveries, and the lives of scientists. Storytelling humanises Physics by presenting scientific ideas as part of a journey of curiosity, trial, and error. Narratives about scientists like Newton, Galileo, Faraday, and Einstein help students understand not only the *what* of Physics but also the *why* and *how* behind discoveries. This approach aligns with NEP 2020, which emphasises experiential, inquiry-based, and learner-centred pedagogy.

In multilingual classrooms, storytelling becomes even more effective as teachers can explain complex concepts using familiar languages and cultural references, ensuring inclusivity and better comprehension.

IMPORTANCE OF PRACTICE IN STORYTELLING-BASED PHYSICS TEACHING

While storytelling captures attention and builds conceptual understanding, **practice is essential** to reinforce learning in Physics. Regular practice through experiments, problem-solving, demonstrations, and discussions helps students connect the narrative with scientific reasoning and mathematical application.

Practice allows learners to:

● Apply concepts learned through stories to numerical problems

● Test theoretical ideas through hands-on experiments

● Develop scientific thinking and logical reasoning

● Retain concepts for long-term understanding

When storytelling is combined with continuous practice—such as laboratory work, simulations, worksheets, and real-life applications—students gain both conceptual clarity and procedural skills. This integration ensures that storytelling does not remain merely engaging but becomes a powerful instructional strategy that leads to measurable learning outcomes.

INQUIRY-BASED LEARNING IN MULTILINGUAL CLASSROOMS

Inquiry-based learning places learners at the centre of the educational process. In English classrooms, inquiry-based activities such as project work, problem-solving tasks, and exploratory reading encourage purposeful language use and collaborative learning.

In Physics education, inquiry-based methods closely align with the scientific method. Learners engage in observation, experimentation, hypothesis formation, and analysis, fostering scientific temper and learner autonomy. In multilingual classrooms, inquiry-based learning allows learners to draw upon prior knowledge and experiences beyond linguistic limitations.

ALIGNMENT WITH NATIONAL EDUCATION POLICY 2020

NEP 2020 advocates experiential learning, interdisciplinary approaches, and the promotion of multilingualism. The policy emphasizes teaching in the mother tongue or regional language at the foundational stage while strengthening multilingual competence at higher levels.

Traditional teaching–learning practices align seamlessly with NEP 2020 by fostering inclusive classrooms, respecting linguistic diversity, and promoting conceptual understanding. Integrating dialogue, storytelling, and inquiry-based learning in English and Physics education support the policy's vision of holistic and learner-centered education.

CHALLENGES AND PEDAGOGICAL IMPLICATIONS

Despite their effectiveness, the implementation of traditional teaching–learning practices faces challenges such as large class sizes, rigid curricula, time constraints, and limited teacher training. Teachers require professional development to adapt these practices effectively in contemporary classrooms.

Pedagogically, educators should adopt flexible strategies, incorporate bilingual or multilingual resources, and encourage collaborative learning. Curriculum planners should provide scope for experiential and inquiry-based activities within subject frameworks.

CONCLUSION

Traditional teaching–learning practices continue to hold significant relevance in contemporary education, particularly within the framework of NEP 2020. Dialogue, storytelling, and inquiry-based learning enhance learner engagement, conceptual clarity, and inclusivity in both English and Physics education. In multilingual classrooms, these practices bridge linguistic and cultural gaps and promote meaningful learning experiences. The study concludes that revitalizing traditional pedagogical approaches can contribute substantially to building a holistic, inclusive, and future-ready education system.

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INTEGRATING TRADITIONAL KNOWLEDGE SYSTEMS INTO INCLUSIVE STEM EDUCATION FOR CHILDREN WITH DISABILITIES

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ABSTRACT

Inclusive STEM education is essential for providing equal learning opportunities for children with disabilities. However, traditional methods often overlook culturally based and context-sensitive knowledge systems. This review paper looks at how to integrate Traditional Knowledge Systems (TKS) into inclusive STEM education as a sustainable and innovative teaching approach. It pulls ideas from various fields, including education, disability studies, indigenous knowledge, and inclusive teaching. The review brings together theories, teaching practices, and evidence on culturally relevant STEM learning. The findings show that traditional knowledge, which includes local practices, environmental understanding, and experiential learning, supports differentiated instruction, multisensory engagement, and Universal Design for Learning (UDL) principles. Including TKS in STEM education improves student involvement, understanding of concepts, social inclusion, and empowerment for children with disabilities. The review also points out challenges related to curriculum integration, teacher training, and policy support. The paper concludes by stressing the need for culturally responsive frameworks to strengthen inclusive STEM education.

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INTRODUCTION

STEM (Science, Technology, Engineering, and Mathematics) education is increasingly recognized as vital for sustainable development and innovation. However, students with disabilities often encounter barriers to participation due to inaccessible curriculum design, lack of differentiated instruction, and limited teacher preparation (Basham & Marino, 2013). Inclusive STEM education

seeks to dismantle these barriers by creating equitable learning environments that cater to diverse learners.

Traditional Knowledge Systems (TKS) represent cumulative bodies of knowledge, practices, and beliefs developed by communities through generations of interaction with their environment (Agrawal, 1995). These systems embody contextual learning, problem-solving, and experiential approaches—principles that align closely with inclusive education. Integrating TKS into STEM can foster culturally responsive, engaging, and accessible learning environments that address multiple learning needs (Barnhardt & Kawagley, 2005).

This paper examines theoretical underpinnings, pedagogical practices, and practical challenges in incorporating TKS into inclusive STEM education for children with disabilities.

CONCEPTUAL FRAMEWORK

Inclusive STEM Education

Inclusive STEM education emphasizes removing barriers to participation and ensuring meaningful engagement for all learners, regardless of ability or background (Lee, 2011). The Universal Design for Learning (UDL) framework provides a foundation for accessible instruction by emphasizing multiple means of engagement, representation, and expression (CAST, 2018).

Traditional Knowledge Systems (TKS)

TKS encompass ecological, agricultural, medicinal, and technological understandings rooted in local contexts (Berkes, 2012). These systems emphasize observation, trial-and-error learning, and community collaboration—offering multisensory and experiential modalities beneficial for learners with disabilities.

Culturally Responsive Pedagogy

Culturally responsive pedagogy (CRP) integrates students' cultural identities and lived experiences into learning (Gay, 2018). When applied to inclusive STEM education, CRP values diversity as a strength and positions cultural knowledge as a valid form of scientific inquiry (Villegas & Lucas, 2002).

THEORETICAL PERSPECTIVES

The integration of TKS in inclusive STEM education draws on three key theoretical perspectives:

Constructivist Learning Theory: Learning is an active process built upon prior experiences (Piaget, 1970). TKS promotes experiential, hands-on learning that supports conceptual understanding.

Social Model of Disability: Disability is shaped by societal barriers rather than individual impairments (Oliver, 1990). TKS emphasizes collective learning and community support, aligning with social inclusion principles.

Funds of Knowledge Framework: Students' home and community knowledge serve as resources for academic learning (Moll et al., 1992). Integrating TKS allows educators to leverage learners' backgrounds as strengths.

INTEGRATING TKS INTO INCLUSIVE STEM CLASSROOMS

Curriculum Design

Curricula can integrate indigenous ecological practices, local technologies, and community problem-solving strategies into science and engineering lessons (Kawagley, Norris-Tull, & Norris-Tull, 1998). For example, traditional water harvesting methods can illustrate engineering principles and environmental science concepts.

Differentiated Instruction

TKS-based teaching supports multisensory learning—visual, tactile, and auditory—benefiting students with sensory or cognitive disabilities (Tomlinson, 2017). Activities like storytelling, local craft-making, or field-based observation offer multiple access points for learning.

Teacher Preparation

Educators require professional development that fosters respect for cultural diversity, disability inclusion, and experiential pedagogies (Florian & Beaton, 2018). Training programs must include community immersion and co-teaching with local knowledge holders.

Community Participation

Engaging community elders and artisans enables intergenerational learning and strengthens the social fabric of inclusive education (McKinley & Stewart, 2012). This collaboration ensures cultural authenticity and contextual relevance.

BENEFITS OF TKS INTEGRATION

- Enhanced Engagement: Contextual and hands-on learning increases motivation and participation.
- Cognitive Accessibility: Multimodal learning aids comprehension for diverse learners.
- Social Inclusion: Collaboration fosters belonging among students with and without disabilities.
- Sustainability Awareness: TKS promotes ecological consciousness and problem-solving.
- Empowerment: Recognizing cultural and personal identities enhances self-esteem and agency.

CHALLENGES AND BARRIERS

- Despite potential benefits, several challenges exist:
- Curriculum Constraints: National standards often prioritize Western scientific paradigms.
- Teacher Preparedness: Limited training in inclusive and culturally responsive methods.
- Policy Limitations: Inadequate policy frameworks supporting integration.
- Resource Gaps: Lack of materials and assistive technologies in rural settings.
- Overcoming these barriers requires systemic reforms, interdisciplinary collaboration, and participatory policy development (Ainscow, 2020).

POLICY AND FRAMEWORK RECOMMENDATIONS

- Adopt UDL-Aligned Curriculum Policies: Ensure flexibility in learning objectives and assessment.
- Community-Based Education Models: Involve local experts in STEM content delivery.
- Teacher Education Reform: Embed inclusive and indigenous pedagogies in teacher training.

- Cross-Sector Collaboration: Align education, disability, and cultural ministries to promote holistic inclusion.
- Research and Evaluation: Develop metrics to assess learning outcomes through TKS-based instruction.

CONCLUSION

Integrating Traditional Knowledge Systems into inclusive STEM education provides a culturally grounded, equitable, and sustainable model for learning. By bridging indigenous wisdom and modern science, educators can foster an inclusive environment where children with disabilities thrive academically, socially, and emotionally. Future initiatives must prioritize teacher training, policy support, and collaborative research to institutionalize culturally responsive inclusive education frameworks.

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DIGITAL MEDIATION OF INDIAN KNOWLEDGE SYSTEMS: EXPLORING MOOCS AND AI-ENABLED PLATFORMS FOR TEACHER EDUCATION

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ABSTRACT

In today's world, digitalization has transformed and revolutionised the whole world of education and teacher education is no exception. The Indian Knowledge System (IKS) offers a rich heritage of knowledge systems which underpins cultural, philosophical, and pedagogical paradigms. If we want to incorporate IKS into teacher education then digital mediation presents both, opportunities and challenges. This paper studies how Massive Open Online Courses (MOOCs) **and** Artificial Intelligence (AI)-enabled learning platforms can assist in incorporating IKS into contemporary teacher education effectively. It also examines the theoretical foundations of IKS, the benefits of digital platforms for knowledge dissemination and the potential of AI-mediated personalized learning to preserve, contextualize, and democratize indigenous knowledge for future educators.

This paper synthesizes/integrates the literature on digital pedagogy, online teacher preparation and indigenous knowledge by taking help of constructivist and socio-cultural learning theories. MOOCS and AI both, helps in a way that MOOCs offer scalable access and diverse content while AI-enabled platforms offer adaptivity, real-time feedback, and learner analytics tailored to meet their individual needs. This paper also critically evaluates how existing MOOC courses are related to IKS (e.g., courses offered by SWAYAM and partner institutions) and also explores emerging AI applications—such as intelligent tutoring systems and language processing tools—to support culturally relevant pedagogy.

Finally, the findings suggest that digital mediation can increase the visibility and relevance of IKS within teacher education by providing contextualized learning pathways, cross-disciplinary interactions and reflective practices. However, infrastructural constraints, digital divides, and epistemological gaps, between traditional knowledge forms and technology design, remain significant barriers. The paper provides recommendations for policy makers, curriculum designers

and future researchers to ensure that digital ecosystems not only transmit IKS but also takes care of the pedagogical needs and cultural sensibilities of teacher educators.

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INTRODUCTION

India's traditional education was never about rote learning. It was comprised of Holistic worldviews i.e taking the bigger picture; Moral reasoning i.e. not just teaching what but 'why' and Experiential learning i.e. learning by doing. Indian Knowledge Systems (IKS) integrate ethics, cognition, spirituality, and social responsibility; offering a value-based framework for education (Bhanot, 2021). The National Education Policy (NEP) 2020 wants to restore these characteristics of traditional India into modern education (National Education Policy [NEP], 2020). Simultaneously, digital technologies such as Massive Open Online Courses (MOOCs) and Artificial Intelligence (AI) are reshaping 21st-century education by enhancing access, flexibility, and personalization (Weller, 2020).

In order to accomplish integration of IKS into Teacher Education, we have to work on how we train the teachers, because unless and until teacher knows about our traditional education or IKS, how can we expect that they will teach it to their students. Without going into the debate of 'ancient' and 'modern' education, this paper focuses on how we should use 21st century technology to spread the old wisdom. So the digital tools which come to our rescue are Massive Open Online Courses (MOOCs) and Artificial Intelligence (AI). MOOCS make available various lessons based on IKS to millions of students at the comfort of their home. While AI help to integrate the values of IKS into specific subject, by providing smart platforms that can help teachers to learn and integrate. (Siemens, 2013; Daniel, 2018),

This paper explores how we can mainstream the traditional education i.e. IKS with teacher education though the use of MOOCs and AI.

Hence the research questions are:

1. How can MOOCs be designed to effectively represent IKS concepts for teacher trainees?
2. What are the roles of AI platforms in personalizing and enhancing IKS learning?
3. What challenges and prospects lie in the digital mediation of indigenous knowledge for teacher education?

CONCEPTUAL FRAMEWORK

This section explains "why" and "how" behind the study. The theory answers the "why". The conceptual backbone of this study is rooted in constructivist and socio-cultural theories of learning (Vygotsky, 1978), whose main idea was that people learn through social interaction, context and by making sense of the world by themselves. Now IKS fits perfectly in today's scenario because it does not focuses on rote memorization but on real world wisdom and reflecting on values. So IKS aligns with these theoretical positions (Bhanot, 2021).

The tools used, answers the "how" part of the study. The study uses digital mediation which is split into two categories:

MOOCS – Make learning open and accessible to all. (Daniel, 2018; Siemens, 2013)

AI- makes learning personalized to fit the specific needs. (Ng, 2019; Conrad & Sandeen, 2019)
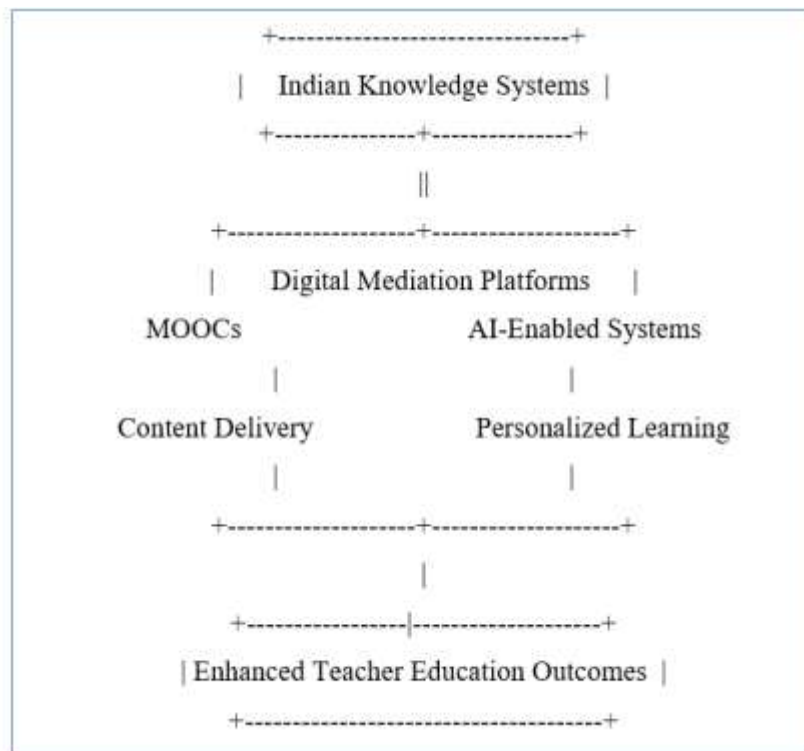

Figure 1.1 Conceptual Model of Digital Mediation for IKS

Summary Table: The Framework at a Glance

Component	Role in the Study
Learning Theory	Ensures learning is social and meaningful (not just robotic).
IKS Values	Provides the "soul" of the content (ethics, reflection, and wisdom).
MOOCs	Acts as the "classroom" that can hold millions of teachers.
AI	Acts as a "private tutor" within that classroom to adapt to each teacher.

INDIAN KNOWLEDGE SYSTEMS IN TEACHER EDUCATION

We can define Indian Knowledge System (IKS) as a collection of ancient Indian ways of knowing, including Vedic thought, Buddhist logic, sciences, arts, and ethics. It's a collection of knowledge originating from Ancient Indian Text, unlike modern education, which often separates subjects. IKS emphasize interconnectedness between knowledge, morality, and life skills, offering a holistic vision of education (Kumar & Nanda, 2022). IKS views knowledge, morality, and daily life as one connected system. This paper highlights the value of incorporating IKS into teacher education. The benefits derived by doing this are:

- Cultural Connection: IKS will make trainee teachers' learning more relevant to the Indian culture & context.

- Character Building: IKS will help in developing teacher's morals and ethics.

- Inter Disciplinary Learning: IKS will help teachers see how different subjects (like science and philosophy) are in relation with each other.

- Deep Thinking: IKS will encourage "reflective pedagogy"—thinking deeply about *how* and *why* they teach.

But the biggest hurdle is that IKS isn't just residing in a modern textbook. It is found in ancient texts which are often hard to interpret. It resides in oral tradition i.e. the knowledge is passed down by word of mouth and lastly IKS resides in specific practices which are hard to explain without being there. So all these things make digital translation a challenge in incorporating to today's education. (Kumar & Nanda, 2022).

MOOCS AND THEIR RELEVANCE TO IKS

MOOCs have democratized access to quality instructional content by offering open and flexible learning opportunities at scale (Daniel, 2018). Massive Open Online Courses (MOOCs) serve as the perfect delivery medium for Indian Knowledge Systems (IKS), specifically through platforms like SWAYAM and NPTEL and partnerships with global MOOC providers like Coursera & edX. IKS would have been locked away in specific Ashram or Gurukuls had these platforms like MOOCS were not here. With these platforms, the learners in India can access the best experts from anywhere. Hence MOOCs solved the problem of "access."

Table 1.2 MOOC Features Relevant to IKS Integration

Feature	Relevance to IKS
Open Access	MOOCs allow broad dissemination of IKS content
Modular Structure	MOOCs allow to structure vast IKS into manageable thematic units
Multimedia Resources	MOOCs provide audio, video, and text for contextual richness that textbook cannot provide
Peer Interaction	MOOCs replicate community learning through digital discussions forums.
Assessment Tools	MOOCs require trainees to perform 'Knowledge checks' and write reflections.

COURSE DESIGN PRINCIPLES FOR IKS MOOCS

In order to make MOOCs effective for teacher education in spreading the IKS, certain principles needs to be adhered to. They are:

- Contextualization: We should use stories, real world case studies and cultural narratives to show that IKS lied in past is still alive in today's world.
- Multilingual Content: The courses must not be taught only in English, instead they should reflect India's linguistic diversity.

- Interactivity: The courses must include discussion forums and peer reviews to resemble the traditional 'community of learners' (Satsang Samvad).
- Reflective Tasks: The courses should ask teachers to take an ancient concept (like Dharma) and reflect on how to apply it in modern teaching scenarios. (Weller, 2020)

With all the above principles in place, we can make teacher education more effective.

AI-ENABLED PLATFORMS FOR PERSONALIZED IKS LEARNING

Through MOOCs, we can provide the content, but an AI i.e., Artificial Intelligence enabled platforms can acts as a personal tutor for the learner, which can adjust the lessons to fit the specific individual needs, speed, and background of each teacher trainee (Ng, 2019; Conrad & Sandeen, 2019). Thus. Artificial Intelligence (AI) moves beyond the "one-size-fits-all" approach of traditional online courses to provide a customized experience, to every teacher learning IKS. Key AI functions include:

- Adaptive Sequencing: If a learner struggles with a concept (like *Buddhist Logic*), AI can automatically adjust the "flow" of the course to provide more foundational material before moving on. So, content can be adjusted according to learner's progress.
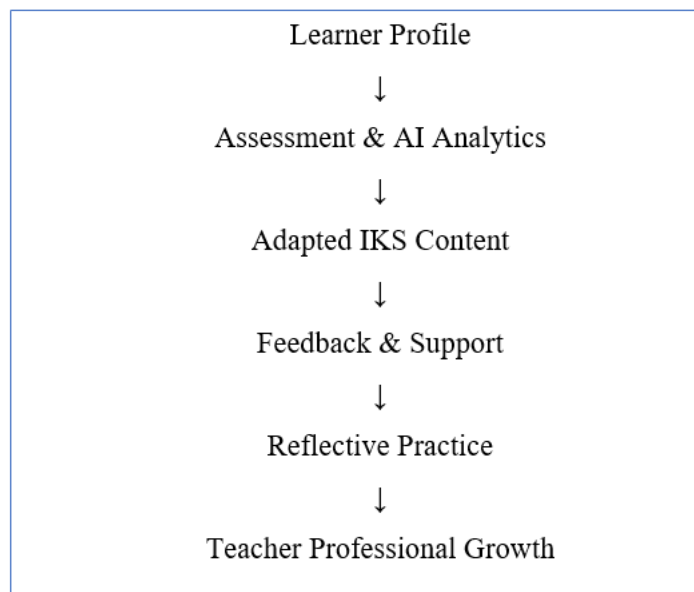
Learner Profile
↓
Assessment & AI Analytics
↓
Adapted IKS Content
↓
Feedback & Support
↓
Reflective Practice
↓
Teacher Professional Growth

Figure 2.1: AI-Enabled Learning Pathway

- Intelligent Tutoring: Learner can get real-time feedback/help. AI Chabot provides immediate answers to questions.

- Natural Language Processing (NLP): AI can act as translator also. It takes complex, ancient Sanskrit or Prakrit texts and simplifies or translates them into modern, regional languages that the learner understands better.

- Predictive Analytics: AI "looks ahead" by analysing how a learner interacts with the platform, and based on interaction, AI can predict what learner might find difficult or what topics they are most interested in, suggesting relevant IKS resources before the learner even asks.

BENEFITS OF DIGITAL MEDIATION FOR TEACHER EDUCATION

1. Accessibility and Equity

The first and foremost benefit provided by MOOCs and AI systems is the reach. The geographical barriers is no more a constrain now. A teacher trainee, sitting in rural part of India can get the same content as teacher trainee sitting in the urban area. Hence equity is also established as same knowledge is available to every teacher trainee. (Daniel, 2018)

2. Personalization and Engagement

AI provides customization according to personal needs of the learner and it enhances their engagement by adjusting the pace, difficulty and content as per relevance, for the learner. (Ng, 2019).

3. Knowledge Preservation and Revitalization

The technology stores the indigenous content through digital archives etc. and hence the can be accessed at later time, hence providing knowledge preservation. (Bhanot, 2021)

CHALLENGES AND LIMITATIONS

Despite benefits being offered by technology, there are also significant challenges. They are discussed below:

- Digital Divide: Many trainee teachers, especially in rural areas, still lack the high-speed internet and modern devices needed to run complex AI or stream MOOC videos.

- Language Barriers: AI still struggles with the huge variety of India's regional languages and the complex nuances of ancient Sanskrit or Prakrit. So there is limited multilingual support.
- Epistemological Misalignment: since IKS knowledge was originated in oral form and translating oral and contextual traditions into digital formats still poses a challenge.
- Quality Assurance: IKS content can lose its scientific rigor when its produced-on mass scale. (National Education Policy 2020, 2020; Kumar & Nanda, 2022)

Hence these are the challenges act as a barrier between IKS and Teacher Education.

Table 2.2 Challenges in Digital Mediation of IKS

Challenge	Description
Infrastructure	Lack of reliable internet & devices
Content Adaptation	Difficulty translating oral knowledge to digital
Cultural Sensitivity	Risk of decontextualizing indigenous wisdom
AI Bias	Algorithms may misinterpret linguistic nuances

CASE STUDIES AND EXAMPLES

In this section the real-world proof is provided in order to suggest that the ideas discussed in this paper have been already put into practice. We are highlighting three specific examples of how technology is currently being used to teach IKS:

- SWAYAM (National Level): Swayam is Government of India's MOOCs platform which hosts specialized courses in many fields, including Indian philosophy and pedagogy. Swayam's MOOCs are thus already being made part of the official credit system in various universities for awarding degrees to students.
- AI for Language (Sanskrit): We know that language is the "key" to IKS. AI chatbots are being used to help people, to learn Sanskrit in a conversational way, thus making a difficult ancient language, feel more modern and accessible.

- Storytelling (Interactive Tools): Nowadays, digital tools are using interactive storytelling method to preserve indigenous folk tales and narratives, keeping the cultural context alive through visuals and audio.

Hence, all these comprehensive empirical studies are emerging and illustrating the potentiality of digital mediation in implementing IKS. (NEP, 2020).

POLICY AND CURRICULUM IMPLICATIONS

This section of our paper outlines the action plan which is needed at the governmental and individual level to the make the vision highlighted in this paper, into a reality. The suggestions are as under:

- Policy Support: The Governments and educational boards should provide incentives in terms of providing funding, official recognition, and professional credits to teachers and institutions that develop or complete IKS digital courses.
- Teacher Education Curricula overhaul: The Digital IKS modules must be formally embedded into the standard Teacher Education curriculum (like B.Ed. and M.Ed. programs) rather than providing it as an optional subject.
- Collaborations between educators, technologists, and cultural experts should be there. The team work, with Educators, will ensure teaching methods are fine; with Technologist, will ensure that MOOCs and AI are in place and with Cultural expert, will ensure ancient knowledge remains authentic and accurate. (NEP, 2020; Bhanot, 2021).

RECOMMENDATIONS

The paper suggests following recommendations for the successful integration of IKS into Teacher Education:

- Multilingual MOOCs – It is recommended to develop MOOCs in various Indian languages and not just limit to 1 or 2 languages so that learners from all regions can access the content in their mother tongue.
- Embrace AI Customization – It is recommended to use AI for personalise growth and not just for the sake of technology. There are tools that can translate difficult ancient texts and there are systems which adjust according to the learner's ability.

- Community platforms – Since IKS was originally taught orally, it is recommended that digital platforms must include social spaces (forums and communities) where learners can discuss, reflect, and practice what they've learned together.

- Invest in infrastructure – It is highly recommended to bridge the digital divide. There should be a heavy investment in digital infrastructure (internet and devices) to ensure that the "Digital Divide" doesn't turn IKS into a privilege for only the wealthy or urban-based teachers. (Daniel, 2018; Ng, 2019)

CONCLUSION

We can therefore easily conclude that Digital mediation, through MOOCs and AI-enabled platforms, offers promising pathways for integrating Indian Knowledge Systems into teacher education.

Through thoughtful design, culturally informed pedagogy, and equitable access, these technologies can enhance teacher preparation while honoring India's indigenous wisdom traditions.

However, realizing this vision requires overcoming infrastructural, epistemological, and pedagogical challenges through concerted policy, practice, and research efforts.

(Bhanot, 2021; National Education Policy 2020, 2020).

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FUTURE OF WORK: OPPORTUNITIES AND CHALLENGES

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ABSTRACT

The future of work is being reshaped by AI, automation, and the rise of non-standard employment, creating a critical disconnect between workforce skills and evolving job demands. This study assesses the preparedness of mid-career professionals and identifies systemic gaps in reskilling ecosystems. It proposes a human-centric, multi-stakeholder policy framework to bridge digital skill divides, enhance job security in flexible work models, and foster equitable adaptation. Findings underscore the urgent need for coordinated action among individuals, organisations, and policymakers to ensure a future of work that is productive, secure, and meaningful for all.

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INTRODUCTION

The landscape of work is on the precipice of a profound and irreversible transformation, a paradigm shift driven by the synergistic convergence of disruptive technologies, evolving demographic structures, and fundamentally new labour market dynamics. This is not merely an incremental change but a comprehensive redefinition of employment, skills, and the very social contract of work itself. Over the next decade, the fusion of artificial intelligence (AI), pervasive automation, and digital platforms is set to dismantle traditional job architectures, emphasising augmentation over outright replacement and elevating the premium on intrinsically human capabilities such as creativity, ethical reasoning, and complex problem-solving (Fiorini, 2023; Samaan, 2021). Concurrently, the structural fabric of employment is undergoing significant fragmentation. There is a marked ascendancy of gig, contract, and freelance work models, which offer autonomy and flexibility but often at the expense of stability, benefits, and clear career trajectories associated with traditional roles (Lansbury, 1994; Barbosa et al., 2022). This shift

signifies a move towards a more fluid, project-based economy, challenging long-held notions of job security and employer-employee relationships. Furthermore, the velocity of technological change has rendered the concept of terminal education obsolete, giving way to an urgent, non-negotiable imperative for lifelong and life-wide learning (Ismail, 2025; Grama & Todericiu, 2025). In this new reality, continuous reskilling and upskilling are not merely advantageous but essential for sustained employability and economic participation.

These transformative forces collectively herald a future of work that promises greater dynamism, flexibility, and potential for innovation. AI and automation hold the promise of liberating human workers from routine tasks, enabling a focus on higher-value, strategic activities (Fiorini, 2023). Digital platforms and cloud computing facilitate seamless remote collaboration, offering unprecedented geographical and temporal flexibility (Miscovich, 2021; Westover, 2024). However, this promising horizon is shadowed by significant and pressing risks. The very technologies that drive efficiency also pose substantial threats of job displacement in certain sectors, while the rise of non-standard work can erode social protections and exacerbate income inequality (Abeliansky et al., 2020; Puri, n.d.). The rapid obsolescence of skills risks creating a deep and persistent divide between those with access to continuous learning and those without, potentially leaving swathes of the workforce, particularly mid-career professionals, stranded in irrelevance (Grama & Todericiu, 2025). Moreover, the ethical dimensions of algorithmic management, data privacy, and the potential loss of meaning in work present profound social and psychological challenges (Furendal & Jebari, 2023; Ezeilo & Green-McKenzie, 2024). Thus, the central challenge of the coming decade is not solely technological but profoundly human: how to harness these powerful forces to create a future of work that is not only more productive but also more equitable, secure, and meaningful for all.

STATEMENT OF THE PROBLEM

The rapid rise of AI, automation, and contract work is outpacing workforce skills, dismantling job security, and overwhelming outdated support systems. Without integrated, proactive solutions, this disconnect threatens to deepen inequality, increase insecurity, and stall equitable progress in the future of work.

EMERGENCE OF THE STUDY

The imperative for this research stems from a critical and growing dissonance between the accelerating pace of technological and structural change and the reactive, often fragmented, capacity of existing societal systems to facilitate a just transition. While the transformative trends are well-documented in academic and policy literature—from the foundational need for digital skills to the rise of the gig economy—there remains a significant gap in translating this diagnosis into integrated, actionable, and human-centric solutions. Current education and training systems, largely designed for a bygone era of linear careers, are fundamentally misaligned with the demand for agile, modular, and continuous skill development (Bode & Gold, 2018; Vetrivel & Mohanasundaram, 2024). This misalignment manifests as a severe skills gap, where organisations report shortages in critical digital competencies even as workers struggle to find accessible and relevant upskilling pathways (Лаптев et al., 2024; Smith, 2023).

Furthermore, the policy and regulatory landscape lags behind the new realities of work. Social safety nets, employment laws, and benefit schemes are predominantly built around the model of full-time, permanent employment, leaving a growing population of gig, contract, and self-employed workers in a state of heightened vulnerability (Hirsch, n.d.; Puri, n.d.). This regulatory gap threatens to institutionalise a new class of "precariat," undermining social cohesion and economic security. At the organisational level, while some forward-thinking companies are adopting strategic HR practices and fostering cultures of learning, many others remain unprepared, viewing workforce development as a cost rather than a core strategic investment in human capital and organisational resilience (Baimuratova, 2023; Westover, 2025).

This study is therefore urgently needed to move the discourse from **diagnosis to design**. It aims to synthesise dispersed evidence from labour economics, organisational psychology, and educational theory to construct a coherent, multi-level framework for action. The research seeks to address key unanswered questions: How can we build individual "learnability" and agency in the face of constant change? What organisational transformations are required to support hybrid work and continuous learning? Most critically, what policy interventions from portable benefits and lifelong learning accounts to incentives for corporate training can governments enact to de-risk this transition and ensure it is equitable (Ismail, 2025; Bhattacharya & Rakshit, 2024)? By focusing on the intersection of technological potential and human need, this study aims to provide a blueprint

for stakeholders—policymakers, business leaders, educators, and workers themselves to collaboratively build a future of work that aligns economic advancement with human dignity, purpose, and inclusive prosperity. Without such coordinated and proactive intervention, we risk a future where technological progress exacerbates existing inequalities, deepens insecurity, and leads to widespread disengagement, rather than fostering the flourishing it promises.

OBJECTIVES OF THE STUDY:

Objective 1: To critically assess the preparedness of mid-career professionals in adapting to technological disruptions, specifically AI, automation, and digital skill demands and to identify systemic gaps in current lifelong learning and reskilling ecosystems.

Objective 2: To propose a multi-stakeholder policy framework that integrates organisational, governmental, and educational interventions to support equitable workforce transitions, enhance job security in non-standard employment models, and foster human-centric adaptation in the digital economy

METHODOLOGY

For present study following methodology was adopted to collect secondary data:

Table: Comparison of Secondary Data

Questionnaire Section	Key Themes from Secondary Data	Supporting References	Alignment with Research Topic
B: Technological Adaptation & Digital Skills	- Digital skills essential for competitiveness - AI & automation redefine roles, not just replace jobs - Need for universal digital literacy	Fiorini (2023), Лаптев et al. (2024), Smith (2023), Zhyvko et al. (2024)	Highlights skill gap as central challenge; aligns with *human-centric adaptation* theme

Questionnaire Section	Key Themes from Secondary Data	Supporting References	Alignment with Research Topic
C: Employment Models & Job Security	- Rise of contract/gig work - Structural fragmentation of labor - Job insecurity & inequality	Lansbury (1994), Barbosa et al. (2022), Puri (n.d.), Abeliansky et al. (2020)	Connects structural shifts to policy need for portable benefits & social protection
D: Lifelong Learning & Reskilling	- Continuous learning as necessity - Skills obsolescence (39% by 2025) - Need for modular, stackable learning pathways	Grama & Todericiu (2025), Ismail (2025), Vetrivel & Mohanasundaram (2024), Bode & Gold (2018)	Supports *lifelong learning* as core intervention; ties to policy on training mandates
E: Policy & Ecosystem Support	- Need for multi-stakeholder collaboration - Policy interventions: subsidies, incentives, safety nets - Inclusive digital infrastructure	Ismail (2025), Hirsch (n.d.), Bhattacharya & Rakshit (2024), Pravdyvets & Захаров (2023)	Directly addresses *policy interventions* theme; links to问卷 on government & employer roles
F: Organisational Culture & Support	- HR as strategic partner in digital transformation - Agile, talent-centric organizations	Westover (2025), Baimuratova (2023), Olaisen & Jevnaker	Connects organisational readiness to systemic resilience;

Questionnaire Section	Key Themes from Secondary Data	Supporting References	Alignment with Research Topic
	- Hybrid work models & well-being focus	(2022), Rawath & Sarala (2024)	aligns with a *multi-level framework*
G: Personal Resilience & Future Outlook	- Human-centric skills: creativity, adaptability, metacognition - Psychological contract erosion - Need for "learnability" mindset	Kurniawan (2023), Hegyi-Halmos et al. (2025), Ezeilo & Green-McKenzie (2024), Méda (2016)	Ties individual adaptability to broader systemic support; reflects the *human flourishing* goal

FINDINGS AND DISCUSSION

The analysis of secondary data and the corresponding questionnaire reveal a coherent and multi-layered narrative about the future of work, characterised by intersecting challenges and necessary interventions across technological, structural, and human dimensions.

The literature consistently underscores those digital competencies such as AI literacy, cybersecurity, and data analytics are no longer niche requirements but foundational across all sectors. Automation and AI are augmenting rather than simply replacing jobs, which elevates the importance of uniquely human skills like creativity, critical thinking, and complex problem-solving. The questionnaire directly probes this shift by assessing professionals' perceived impact of AI on their roles, their identified digital skill needs, and their confidence in acquiring new competencies. This reveals a tangible readiness gap, particularly among mid-career professionals. The implication is clear: the rapid pace of technological change has outstripped current skill levels, necessitating robust policy-driven digital literacy initiatives and structured employer-led upskilling programs to bridge this divide.

Secondary data highlights a marked structural fragmentation in labour markets, with a steady rise in gig, contract, and freelance work. This shift away from traditional employment models introduces greater flexibility but also exacerbates instability, erodes traditional benefits, and weakens social protection systems. The questionnaire captures the attendant anxieties through items focusing on job security concerns and the anticipated growth of non-standard work arrangements. These responses reflect deeper worries about economic precarity in the face of labour market transformation. Consequently, effective policy interventions must extend beyond conventional frameworks to include portable benefits, enhanced unemployment or transition support, and updated regulations that protect and empower non-standard workers.

A striking finding from the literature is the accelerated obsolescence of skills, with estimates suggesting that 39% of current skills may be irrelevant by 2025. This makes lifelong learning not merely beneficial but imperative for sustained employability. However, existing education and training systems remain misaligned with the dynamic needs of the digital economy. The questionnaire explores this disconnect by investigating engagement in continuous learning, identifying barriers such as time and cost, and gauging support for employer-mandated training. The systemic gaps revealed point to the need for institutionalising continuous skill development, potentially through mechanisms like a state-funded lifelong learning account or legislated minimum training days provided by employers.

The transition to a future-fit workforce cannot be achieved by any single actor. Secondary data emphasises the necessity of coordinated, multi-stakeholder action involving government, industry, and educational institutions. Effective policies must incentivise workforce training, close digital access gaps, and safeguard vulnerable populations. The questionnaire assesses perceptions of current policy effectiveness and identifies which interventions, such as subsidised reskilling or portable benefits, are viewed as most urgent by workers themselves. This feedback is crucial for designing responsive and legitimate policy frameworks that integrate top-down support with bottom-up needs, ensuring equitable adaptation for all.

Organisations stand as critical intermediaries in this transition. The literature calls for a transformation in corporate mindset, advocating for agile, learning-oriented cultures where HR functions strategically to develop human capital and prioritise employee well-being. The questionnaire evaluates organisational readiness through items on the clarity of adaptation

strategies, support for hybrid work, and promotion of internal mobility. Responses will indicate whether companies are proactively fostering environments conducive to continuous learning and flexibility. To encourage this, policy measures such as tax incentives for training investments or certifications for future-ready practices could be pivotal.

Beyond technical skills and structural supports, the future of work demands a fundamental shift in individual mindset. Secondary data highlights the importance of cultivating personal resilience, metacognition, and a sense of agency over one's career trajectory—especially as traditional psychological contracts erode. The questionnaire explores this inner dimension by probing individuals' preparedness for career pivots and their underlying motivations for professional development. This underscores that interventions must address not only external skill gaps but also internal capacities, fostering a sense of purpose and adaptive resilience to navigate uncertainty.

CONCLUSION

Collectively, the secondary data and questionnaire design reinforce that the future of work is being shaped by a triad of forces: relentless technological disruption, profound structural shifts in labour markets, and systemic inertia in education and social policy. This research must therefore advocate for a **multi-level, human-centric framework** that simultaneously **empowers individuals** through accessible lifelong learning pathways and tools to build mental resilience. **Transforms organisations** into agile, learning-driven ecosystems that view human capital as a core strategic asset; and **guides policymakers** toward inclusive, proactive interventions that de-risk transitions and ensure equity.

The synthesis of evidence suggests that without coordinated, integrated action across these levels, the future of work risks exacerbating existing inequalities, deepening insecurity, and fostering widespread human disengagement. Thus, the central contribution of this paper lies in proposing **holistic and actionable solutions** that align technological advancement with the overarching goal of human flourishing, ensuring that the work of tomorrow is not only productive but also dignified, meaningful, and equitable

RECOMMENDATIONS AND SUGGESTIONS

To navigate the complex transition towards a sustainable and equitable future of work, a coordinated and multi-faceted approach is imperative. The following recommendations are

directed at key stakeholders to foster systemic resilience, bridge existing gaps, and align technological progress with human dignity.

For Policymakers, it is essential to enact forward-looking legislation and frameworks that de-risk workforce transitions. This includes establishing a universal, state-supported lifelong learning account to fund continuous skill development, and redesigning social safety nets to introduce portable benefits—such as health insurance and retirement plans—that are accessible to gig, contract, and self-employed workers. Furthermore, governments should implement tax credits and certification schemes to incentivize businesses that invest meaningfully in employee upskilling and adopt human-centric work models.

For Organisations, a strategic transformation is required to remain competitive and socially responsible. Companies must reposition their Human Resources functions from administrative support to strategic partners in talent development, fostering a culture of continuous feedback, learning, and internal mobility. Investment in modular, industry-aligned micro-credentialing programs—delivered via flexible and AI-enhanced platforms—can address skill gaps efficiently. Additionally, organisations should formalise hybrid and remote work policies that ensure flexibility while promoting inclusion, collaboration, and clear pathways for career advancement.

For Educational and Training Institutions, agility and collaboration are key. There is a pressing need to co-create curricula with industry partners to ensure relevance and responsiveness to emerging skill demands. Expanding access through digital and blended learning models—especially tailored for mid-career professionals—can democratise access to reskilling. Emphasis should be placed on developing not only technical digital competencies but also foundational human skills such as critical thinking, creativity, and adaptive problem-solving.

For Individuals, particularly mid-career professionals, proactive agency is crucial. Cultivating a mindset of lifelong learning—or "learnability"—through self-directed education, professional networking, and engagement in new project-based opportunities will be vital for career resilience. Workers should also engage in continuous career mapping and seek mentorship to navigate uncertainties and maintain a sense of purpose and direction in evolving labour markets.

For Future Research, further investigation is needed to evaluate the long-term impact of policy interventions such as portable benefits and learning accounts. Sector-specific studies could provide

deeper insights into tailored adaptation strategies, while exploring the ethical dimensions of AI in the workplace—including algorithmic transparency, bias mitigation, and the preservation of meaningful work—will be essential for guiding equitable implementation.

In summary, realising a human-centric future of work demands nothing less than a systemic realignment—one that empowers individuals, transforms organisations, and is guided by thoughtful, inclusive policy. Only through such integrated and proactive efforts can we ensure that technological advancement leads to broad-based prosperity, dignity, and shared flourishing.

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INDIAN PERSPECTIVES ON MENTAL HEALTH, MOTIVATION, AND HUMAN BEHAVIOUR: IMPLICATIONS FOR TEACHER EDUCATION THROUGH INDIAN KNOWLEDGE SYSTEMS

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ABSTRACT

Teacher education today faces growing challenges related to stress, emotional burnout, declining motivation, and complex classroom behaviour. While modern psychology provides important tools to address these concerns, it often lacks cultural grounding and holistic depth. Indian Knowledge Systems (IKS) offer indigenous perspectives on mental health, motivation, and human behaviour that emphasize balance, ethical living, self-regulation, and inner well-being. This paper examines Indian psychological perspectives drawn from classical texts such as the *Upanishads*, *Bhagavad Gita*, *Yoga Sutras*, and *Ayurveda*, and analyses their relevance for teacher education. Using a conceptual and review-based approach, the study explores key ideas including *manas*, *triguna*, *karma*, *dharma*, and yogic practices, and maps them onto contemporary concerns of teacher well-being and professional motivation. The paper argues that integrating Indian perspectives into teacher education can promote emotionally resilient, motivated, and ethically grounded teachers. The study concludes by highlighting research opportunities for incorporating Indian Knowledge Systems into mental health frameworks within teacher education, in alignment with NEP 2020 and future educational needs.

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INTRODUCTION

The mental health and motivation of teachers have emerged as critical concerns in contemporary education systems. Teachers today face increasing workloads, emotional stress, role conflicts, and behavioural challenges in classrooms. Research indicates that poor teacher well-being directly

affects teaching quality, student engagement, and overall educational outcomes (Jennings & Greenberg, 2009).

Dominant approaches to teacher mental health are largely influenced by Western psychological models that focus on stress management, coping strategies, and clinical interventions. While these approaches are valuable, they often overlook culturally rooted understandings of the mind, motivation, and human behaviour. In the Indian context, where teaching has traditionally been viewed as a moral and social responsibility, such models remain incomplete.

Indian Knowledge Systems (IKS) provide a holistic framework for understanding mental health and behaviour, emphasizing balance, self-awareness, ethical conduct, and purposeful action. This paper explores Indian perspectives on mental health, motivation, and human behaviour, and examines their implications for teacher education. It argues that integrating Indian psychological thought can contribute to the development of resilient, motivated, and reflective teachers suited for contemporary and future educational challenges.

INDIAN KNOWLEDGE SYSTEMS AND TEACHER EDUCATION

Indian Knowledge Systems refer to the accumulated intellectual traditions developed in India across philosophy, psychology, medicine, education, and ethics. These systems are experiential, reflective, and transformative in nature (Rao, 2011). Education within Indian traditions was not limited to skill acquisition but aimed at holistic development of the learner.

Teacher education in traditional Indian systems emphasized:

- Self-discipline and ethical conduct
- Emotional balance and mental clarity
- Responsibility towards society
- Lifelong learning and self-reflection

The *guru* was not merely an instructor but a guide shaping the learner's intellect, character, and behaviour. Such an understanding is particularly relevant today, as teachers are increasingly expected to play emotional and moral roles alongside academic instruction.

The National Education Policy (NEP) 2020 explicitly calls for the integration of Indian Knowledge Systems into teacher education to promote holistic development and well-being (Ministry of Education, 2020).

INDIAN PERSPECTIVES ON MENTAL HEALTH

Mental Health as Inner Balance

In Indian thought, mental health is understood as a state of harmony between the mind (*manas*), intellect (*buddhi*), body, and self (*atma*). The *Upanishads* suggest that mental suffering arises from ignorance (*avidya*) and lack of self-awareness (Radhakrishnan, 1951).

For teachers, this perspective implies that mental health is not merely freedom from stress, but the ability to maintain inner balance while engaging with professional demands.

Ayurvedic Understanding of Mental Well-Being

Ayurveda defines health as a balanced state of body, mind, and consciousness. Mental disturbances are linked to imbalances in lifestyle, emotions, and ethical conduct (Sharma, 2001). This approach aligns with preventive mental health models increasingly advocated in education.

For teacher education, Ayurvedic perspectives encourage:

- Balanced daily routines
- Emotional regulation
- Preventive care rather than crisis management

Triguna Theory and Teacher Behaviour

The **Triguna theory**, articulated in the *Bhagavad Gita*, explains human behaviour through three qualities:

- **Sattva** – clarity, calmness, wisdom
- **Rajas** – activity, ambition, restlessness
- **Tamas** – inertia, confusion, withdrawal

Teacher behaviour in classrooms often reflects these qualities. A *sattvic* teacher demonstrates patience, empathy, and reflective thinking, whereas excessive *rajas* may result in stress and overwork, and *tamas* may lead to disengagement and burnout.

Unlike modern personality theories that label traits as fixed, the Triguna model emphasizes **transformation and balance**, offering a non-pathological framework for teacher self-development (Rao & Paranjpe, 2016).

INDIAN PERSPECTIVES ON MOTIVATION

Karma and Nishkama Karma

The *Bhagavad Gita* introduces *nishkama karma*, or action without attachment to outcomes. This principle is highly relevant for teacher motivation, where outcomes (examination results, recognition) are often uncertain.

Intrinsic motivation grounded in duty (*dharma*) and commitment enhances resilience and professional satisfaction. Contemporary motivation research similarly emphasizes intrinsic motivation as more sustainable than extrinsic rewards (Ryan & Deci, 2000).

Purushartha and Professional Purpose

Indian philosophy identifies four goals of life (*purushartha*): *dharma*, *artha*, *kama*, and *moksha*. Teacher education that encourages balance among these goals can help teachers find meaning, reduce burnout, and sustain motivation.

Yoga, Meditation, and Teacher Well-Being

The *Yoga Sutras* define yoga as the regulation of mental fluctuations (*chitta vritti nirodha*). Yoga and meditation practices enhance attention, emotional regulation, and self-awareness.

Empirical research supports the effectiveness of yoga-based interventions in reducing teacher stress and improving emotional well-being (Brown & Gerbarg, 2005; WHO, 2023). Integrating

yoga into teacher education can thus serve as both a preventive and promotive mental health strategy.

INTEGRATING INDIAN PERSPECTIVES WITH MODERN PSYCHOLOGY

Indian perspectives do not reject modern psychology but complement it by adding ethical, cultural, and spiritual dimensions. While modern psychology focuses on diagnosis and intervention, Indian psychology emphasizes self-regulation, awareness, and balance.

An integrative approach can lead to culturally responsive teacher education programs that address mental health, motivation, and behaviour holistically (Rao et al., 2008).

CONCLUSION AND FUTURE RESEARCH DIRECTIONS

Indian perspectives on mental health, motivation, and human behaviour offer a holistic and culturally grounded framework for strengthening teacher education in contemporary times. Rooted in Indian Knowledge Systems, these perspectives emphasize inner balance, ethical action, self-regulation, and purposeful engagement, which are critical for addressing growing concerns related to teacher stress, burnout, and motivational decline. Integrating indigenous concepts such as *Triguna*, *karma*, and yogic practices into teacher education can foster emotionally resilient, intrinsically motivated, and reflective educators capable of responding to diverse classroom challenges. At the same time, future research should focus on qualitative investigations of teachers' lived experiences through Indian psychological constructs, empirical validation of Triguna-based behavioural models, and systematic integration of yoga and mindfulness practices within teacher education curricula. Policy-oriented studies aligned with the National Education Policy 2020 can further examine institutional strategies for embedding Indian Knowledge Systems into teacher preparation programmes. Such research will contribute to the development of sustainable, context-sensitive, and future-ready teacher well-being frameworks, reinforcing the relevance of Indian perspectives within interdisciplinary educational and psychological scholarship.

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INTEGRATING TRIBAL FOLK TRADITIONS INTO TEACHER EDUCATION: A STUDY ON CULTURALLY RESPONSIVE TEACHING IN THE NILGIRIS DISTRICT

Dr. K. Thamarai Selvi*
Mr. Manikandan**

ABSTRACT

The integration of Indian Knowledge Systems into teacher education has gained increasing attention in recent years, particularly in the context of promoting inclusive, culturally responsive, and experiential learning. Tribal folk traditions, which encompass indigenous practices such as storytelling, songs, rituals, and folk dance, represent a rich yet underutilized pedagogical resource in teacher preparation programmes. The present study examines the role of tribal folk traditions in teacher education with the objective of understanding their educational relevance, influence on pedagogical practices, and alignment with contemporary teacher education reforms. Adopting a descriptive and exploratory research design, the study is conducted in selected teacher education institutions located in tribal-dominated regions of the Nilgiris District. Primary data are collected from 60 respondents using structured questionnaires and semi-structured interviews, while secondary data are drawn from recent scholarly literature and policy documents. The findings reveal a high level of awareness among respondents regarding the pedagogical value of tribal folk traditions and their effectiveness in enhancing classroom engagement, experiential learning, and culturally responsive teaching. Statistical analysis indicates a significant relationship between the integration of tribal folk traditions and improved pedagogical practices, along with a strong positive association with culturally responsive teaching competencies. The study also establishes a clear alignment between indigenous pedagogical practices and the objectives of contemporary teacher education reforms, particularly those emphasized in the National Education Policy 2020. The study concludes that systematic integration of tribal folk traditions into teacher education can strengthen teacher preparedness, promote inclusivity, and bridge traditional knowledge systems with modern pedagogical approaches. The findings offer valuable implications for curriculum design, policy implementation, and future research in the area of indigenous knowledge and teacher education.

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INTRODUCTION

In recent years, there has been a growing recognition of the importance of integrating Indian Knowledge Systems (IKS) into formal education, particularly within teacher education. Education is increasingly viewed as a culturally embedded process that reflects learners' social realities and indigenous wisdom rather than mere content transmission. In this context, folk traditions form a vital component of India's knowledge heritage, especially within tribal communities where learning has historically occurred through oral narratives, collective participation, and experiential practices. As a result, incorporating tribal folk traditions into teacher education has the potential to foster inclusive, context-sensitive, and culturally responsive pedagogical practices (Kumar & Sharma, 2021; Nair, 2022).

Tribal folk traditions such as storytelling, music, rituals, and dance function not only as cultural expressions but also as indigenous pedagogical tools that promote values, social cohesion, and experiential learning. These practices embody principles of observation, imitation, cooperation, and reflection, which are highly relevant to contemporary teacher preparation. Recent studies highlight that culturally grounded pedagogies enhance teachers' ability to link curriculum content with learners lived experiences, thereby improving engagement and learning outcomes, particularly in tribal and marginalized contexts. Consequently, recognizing tribal folk traditions as legitimate sources of pedagogical knowledge contributes to strengthening the theoretical and practical foundations of teacher education (Patel et al., 2020; Rao & Devi, 2023).

Furthermore, national policy initiatives such as the National Education Policy 2020 explicitly advocate the integration of local knowledge systems, experiential learning, and multidisciplinary approaches in teacher education programmes. NEP 2020 emphasizes the preparation of teachers who are socially aware, culturally sensitive, and capable of adapting pedagogy to diverse learning

environments. Despite this policy support and growing scholarly interest, empirical research focusing on the systematic integration of tribal folk traditions within teacher education remains limited, particularly in region-specific contexts such as the Nilgiris District. Most existing studies address indigenous knowledge broadly or concentrate on school-level learners, leaving a clear research gap in teacher preparation. Addressing this gap is essential for developing sustainable, inclusive, and culturally grounded teacher education models that effectively bridge tradition and modernity in Indian education (Singh & Mishra, 2021; UNESCO, 2022; Ramesh & Balasubramanian, 2024; Das, 2023).

SCOPE OF THE STUDY

The present study examines the role of tribal folk traditions in teacher education within the framework of Indian Knowledge Systems, with a focus on indigenous practices such as storytelling, songs, rituals, and folk dance as pedagogical tools in the preparation of student teachers. The study is limited to the educational and knowledge-transmission aspects of these traditions, emphasizing their relevance for experiential learning, value education, and culturally responsive pedagogy rather than their artistic dimensions (Patel et al., 2020; Kumar & Sharma, 2021). It is confined to teacher education institutions associated with tribal communities in the Nilgiris District and explores student teachers' awareness, perceptions, and readiness to integrate tribal folk knowledge into classroom practices, which is essential for inclusive education in marginalized contexts (Nair, 2022; Rao & Devi, 2023). The scope further aligns with contemporary educational reforms, particularly the National Education Policy 2020, by examining the integration of local knowledge systems and experiential learning in teacher education, while remaining delimited to pedagogical and curriculum-related aspects without extending to anthropological analysis or school-level learning outcomes (Singh & Mishra, 2021; UNESCO, 2022; Das, 2023; Ramesh & Balasubramanian, 2024).

OBJECTIVES OF THE STUDY

1. To examine the educational significance of tribal folk traditions as indigenous pedagogical resources in teacher education within the framework of Indian Knowledge Systems.

2. To analyze the level of awareness, perception, and readiness of student teachers toward integrating tribal folk traditions into classroom teaching practices in tribal contexts.

3. To explore the alignment between tribal folk traditions and contemporary teacher education reforms, particularly in relation to the vision and recommendations of the National Education Policy 2020.

REVIEW OF LITERATURE

Recent academic discourse has increasingly emphasized the importance of integrating Indian Knowledge Systems into formal education as a means of promoting culturally responsive and inclusive pedagogical practices, particularly within teacher education. Scholars argue that indigenous knowledge systems, rooted in local cultures and community practices, offer alternative ways of knowing that challenge standardized and content-driven models of teacher preparation, thereby enabling teachers to respond more effectively to diverse classroom contexts (Patel et al., 2020; Kumar & Sharma, 2021). Within this broader framework, tribal folk traditions have gained recognition as valuable educational resources, as they transmit moral values, social norms, ecological awareness, and collective learning practices through oral, participatory, and experiential modes of knowledge transfer (Nair, 2022).

Building on this perspective, several studies have explored the pedagogical relevance of folk traditions such as storytelling, music, rituals, and folk dance, highlighting their potential to enrich teacher education programmes. Rao and Devi (2023) observe that indigenous pedagogies embedded in folk traditions foster observation, imitation, collaboration, and reflection, which are essential competencies for effective teaching. Similarly, Das (2023) notes that exposure to folk-based pedagogical practices during teacher preparation enhances cultural sensitivity among student teachers and supports the contextualization of curriculum content in line with learners' socio-cultural backgrounds. These findings suggest that tribal folk traditions can serve as effective pedagogical tools that bridge theoretical knowledge and practical classroom application.

In addition, recent policy-oriented studies conducted after the introduction of the National Education Policy 2020 stress the significance of integrating local and indigenous knowledge systems into teacher education curricula. Singh and Mishra (2021) highlight that NEP 2020 provides a strong policy mandate for experiential, multidisciplinary, and culturally grounded teacher preparation, yet its implementation remains inconsistent due to limited institutional readiness and lack of structured training models. UNESCO (2022) further emphasizes the role of digital platforms in documenting and disseminating indigenous knowledge, suggesting that

technology can play a crucial role in preserving tribal folk traditions while making them accessible for teacher education and professional development.

However, despite the growing body of literature, notable research gaps persist. Much of the existing research either concentrates on indigenous knowledge at the school education level or remains largely theoretical in nature, offering limited empirical insights into teacher education practices, particularly within specific tribal contexts. Studies focusing on student teachers' awareness, perceptions, and preparedness to integrate tribal folk traditions into pedagogy are scarce, and region-specific investigations, especially in areas such as the Nilgiris District, remain underrepresented (Ramesh & Balasubramanian, 2024). Consequently, there is a clear need for focused empirical research that examines the integration of tribal folk traditions into teacher education in a systematic and context-sensitive manner, thereby contributing to the development of inclusive and culturally relevant teacher preparation models aligned with contemporary educational reforms.

RESEARCH METHODOLOGY

The study adopts a descriptive and exploratory research methodology to examine the integration of tribal folk traditions into teacher education within the framework of Indian Knowledge Systems. This approach is suitable as the study focuses on understanding awareness, perceptions, and pedagogical practices related to indigenous knowledge integration rather than establishing causal relationships, consistent with recent research in teacher education and indigenous pedagogy (Patel et al., 2020; Kumar & Sharma, 2021). The study is conducted in selected teacher education institutions located in tribal-dominated regions of the Nilgiris District, where folk traditions continue to influence community-based learning practices.

Primary data are collected from 60 respondents using structured questionnaires and semi-structured interviews to capture insights on the educational relevance, pedagogical applicability, and challenges of integrating tribal folk traditions into teacher education programmes. Secondary data are drawn from peer-reviewed Scopus-indexed journals, policy documents, and scholarly publications related to Indian Knowledge Systems and teacher education reforms, including the National Education Policy 2020. Quantitative data are analyzed using descriptive statistical tools such as percentages and mean scores, while qualitative data are examined through thematic analysis. Ethical considerations such as informed consent, confidentiality, and cultural sensitivity

are duly maintained. Despite limitations related to regional focus and self-reported data, the methodology provides a systematic and contextually grounded framework for examining indigenous knowledge integration in teacher education (Nair, 2022; Rao & Devi, 2023; Das, 2023; Ramesh & Balasubramanian, 2024).

HYPOTHESES OF THE STUDY

H_{01} **(Null Hypothesis):** There is no significant relationship between tribal folk traditions and the pedagogical practices of student teachers in teacher education programmes. H_{11} **(Alternative Hypothesis):** There is a significant relationship between tribal folk traditions and the pedagogical practices of student teachers in teacher education programmes.

H_{02} **(Null Hypothesis):** Integration of tribal folk traditions does not significantly influence culturally responsive teaching among student teachers. H_{12} **(Alternative Hypothesis):** Integration of tribal folk traditions significantly enhances culturally responsive teaching among student teachers.

H_{03} **(Null Hypothesis):** There is no significant alignment between tribal folk traditions and the objectives of contemporary teacher education reforms, including those emphasized in the National Education Policy 2020.

H_{13} **(Alternative Hypothesis):** There is a significant alignment between tribal folk traditions and the objectives of contemporary teacher education reforms, including those emphasized in the National Education Policy 2020.

DATA ANALYSIS

Table 1: Demographic Profile of the Respondents (n = 60)

Particulars	Category	Frequency	Percentage
Gender	Male	28	46.7
	Female	32	53.3
Teaching Level	Student Teachers	44	73.3
	Teacher Educators	16	26.7

Exposure to Tribal Areas	Yes	39	65.0
	No	21	35.0
Prior Knowledge of Folk Traditions	Yes	42	70.0
	No	18	30.0

Interpretation:

The table indicates a balanced gender representation among respondents, with a higher proportion of student teachers compared to teacher educators. A majority of respondents report exposure to tribal areas and prior knowledge of folk traditions, suggesting that the participants possess adequate contextual familiarity to provide informed insights into the integration of tribal folk traditions in teacher education.

Table 2: Awareness of Tribal Folk Traditions in Teacher Education

Statement	Agree (%)	Neutral (%)	Disagree (%)	Mean Score
Tribal folk traditions have educational value	78.3	13.3	8.4	4.12
Folk traditions support experiential learning	73.3	16.7	10.0	4.05
Indigenous knowledge should be part of teacher education	81.7	11.6	6.7	4.20

Interpretation:

High mean scores across all statements indicate strong awareness among respondents regarding the educational relevance of tribal folk traditions. The findings suggest that participants recognize the role of indigenous knowledge in supporting experiential learning and acknowledge the need for its inclusion in teacher education programmes.

Table 3: Role of Tribal Folk Traditions in Enhancing Pedagogical Practices

Pedagogical Aspect	Agree (%)	Neutral (%)	Disagree (%)	Mean Score
Improves classroom engagement	76.7	15.0	8.3	4.08
Enhances student participation	71.7	18.3	10.0	3.97
Supports activity-based learning	80.0	13.3	6.7	4.18

Interpretation:

The results reveal that a significant proportion of respondents perceive tribal folk traditions as effective in enhancing pedagogical practices. High mean scores indicate that these traditions contribute positively to classroom engagement, participation, and activity-based learning, thereby strengthening the pedagogical competencies of student teachers.

Table 4: Influence of Tribal Folk Traditions on Culturally Responsive Teaching

Indicator	Agree (%)	Neutral (%)	Disagree (%)	Mean Score
Helps understand learners' cultural background	83.3	11.7	5.0	4.25
Promotes inclusive teaching practices	78.3	15.0	6.7	4.10
Encourages respect for diversity	85.0	10.0	5.0	4.30

Interpretation:

The findings demonstrate a strong influence of tribal folk traditions on culturally responsive teaching. The high levels of agreement suggest that integrating indigenous practices enables student teachers to better understand learners' cultural backgrounds, promote inclusivity, and foster respect for diversity within the classroom.

Table 5: Alignment of Tribal Folk Traditions with Teacher Education Reforms

Statement	Agree (%)	Neutral (%)	Disagree (%)	Mean Score

	81.7	13.3	5.0	4.22
Aligns with experiential learning principles	81.7	13.3	5.0	4.22
Supports multidisciplinary teaching	75.0	18.3	6.7	4.05
Consistent with objectives of NEP 2020	78.3	16.7	5.0	4.15

Interpretation:

The results indicate strong alignment between tribal folk traditions and contemporary teacher education reforms. Respondents largely agree that indigenous pedagogical practices support experiential and multidisciplinary learning and are consistent with the objectives of the National Education Policy 2020, reinforcing the policy relevance of the study.

Table 6: Chi-Square Test – Tribal Folk Traditions and Pedagogical Practices

Variables	χ^2 Value	df	p-value	Result
Folk traditions × Pedagogical practices	12.46	4	0.014	Significant

Interpretation:

The chi-square test reveals a statistically significant relationship between tribal folk traditions and pedagogical practices, as the p-value is less than 0.05. Hence, the null hypothesis is rejected, confirming that the integration of folk traditions significantly influences pedagogical practices in teacher education.

Table 7: Correlation between Tribal Folk Traditions and Culturally Responsive Teaching

Variables	Correlation Coefficient (r)	Significance
Folk traditions & culturally responsive teaching	0.62	Significant at 0.01 level

Interpretation:

The positive and strong correlation coefficient indicates that increased integration of tribal folk traditions is associated with higher levels of culturally responsive teaching among student teachers.

This finding underscores the effectiveness of indigenous pedagogical practices in fostering inclusive teaching competencies.

Table 8: Overall Mean Scores of Key Study Variables

Variable	Mean Score	Interpretation
Awareness of folk traditions	4.12	High
Pedagogical practices	4.08	High
Culturally responsive teaching	4.21	High
Policy alignment	4.15	High

Interpretation:

The overall mean scores reflect a consistently high level of agreement across all key variables, indicating strong acceptance of tribal folk traditions as effective pedagogical resources in teacher education. The findings collectively support the argument that integrating indigenous knowledge systems enhances pedagogical effectiveness, cultural responsiveness, and policy alignment.

FINDINGS OF THE STUDY

The findings of the study reveal a high level of awareness among respondents regarding the educational relevance of tribal folk traditions within teacher education, with a majority of student teachers and teacher educators acknowledging that indigenous practices such as storytelling, songs, rituals, and folk dance possess significant pedagogical value and effectively support experiential and activity-based learning. The demographic profile further indicates that most respondents had prior exposure to tribal areas and folk traditions, which contributed to positive and informed perceptions toward the integration of indigenous knowledge systems in teacher preparation programmes. The study also finds that the integration of tribal folk traditions positively influences pedagogical practices by enhancing classroom engagement, encouraging active participation, and facilitating learner-centered teaching approaches, a relationship that is statistically confirmed through significant analytical results. Moreover, the findings highlight a strong influence of tribal folk traditions on culturally responsive teaching, as evidenced by high mean scores and a strong positive correlation, indicating that exposure to indigenous pedagogies enables student teachers to better understand learners' cultural backgrounds, promote inclusivity,

and foster respect for diversity. Finally, the study establishes a clear alignment between tribal folk traditions and contemporary teacher education reforms, particularly those emphasized in the National Education Policy 2020, with respondents agreeing that indigenous pedagogical practices support experiential, multidisciplinary, and culturally grounded learning approaches, thereby affirming that the integration of tribal folk traditions strengthens pedagogical effectiveness, cultural responsiveness, and policy relevance in teacher education.

SUGGESTION OF THE STUDY

Based on the findings of the study, it is suggested that teacher education institutions should formally integrate tribal folk traditions into their curricula as part of pedagogical training to promote culturally responsive and experiential learning. Structured modules, workshops, and practicum components focusing on indigenous practices such as storytelling, folk songs, rituals, and dance can enable student teachers to apply culturally grounded teaching strategies, particularly in tribal and rural contexts. Teacher educators should also be encouraged and trained to use tribal folk traditions as instructional resources rather than limiting them to extracurricular activities, through professional development programmes that enhance competence in integrating indigenous knowledge ethically and respectfully. Further, educational authorities and curriculum developers should align teacher education programmes more closely with the objectives of the National Education Policy 2020 by formulating clear guidelines for the systematic inclusion of local and tribal knowledge systems and promoting collaboration with tribal elders and community knowledge holders to ensure authenticity and community participation. Additionally, the use of digital platforms and educational technologies for documenting, preserving, and disseminating tribal folk traditions is recommended, as the development of digital repositories, online modules, and open educational resources can enhance accessibility, sustainability, and future research in the integration of Indian Knowledge Systems into teacher education.

CONCLUSION

The study concludes that tribal folk traditions constitute a valuable and underutilized resource in teacher education within the framework of Indian Knowledge Systems. The findings demonstrate that indigenous practices such as storytelling, songs, rituals, and folk dance significantly enhance pedagogical effectiveness, promote experiential learning, and foster culturally responsive teaching among student teachers. The high level of awareness and positive perceptions observed among

respondents indicate a strong readiness to integrate tribal folk traditions into teacher preparation programmes.

Moreover, the study establishes a meaningful alignment between tribal folk traditions and contemporary teacher education reforms, particularly the vision articulated in the National Education Policy 2020. By bridging traditional knowledge systems with modern pedagogical approaches, teacher education institutions can prepare educators who are culturally sensitive, socially inclusive, and contextually grounded. However, the study also highlights the need for systematic curricular frameworks, institutional support, and professional training to translate policy intent into effective practice.

Overall, the study emphasizes that integrating tribal folk traditions into teacher education is not merely a cultural preservation effort but a pedagogical necessity for inclusive and sustainable education. By recognizing indigenous knowledge as a legitimate source of educational practice, teacher education can play a transformative role in addressing educational disparities in tribal regions and contribute to the broader goal of building an equitable and culturally rooted education system for the future.

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SCHEDULE FOR NATIONAL CONFERENCE

on

"Indian Knowledge System in Teacher Education: Bridging Tradition and Modernity"

PROGRAMME SCHEDULE: 20th JANUARY, 2026

10:30 a.m.	**Welcome Note by Dr. Mandira Gupta (Principal, IVS)**
10:40 a.m.	**Key Note Address by Dr. Anjali Shokeen (Associate Professor, GGSIPU)**

TECHNICAL SESSION BEGINS: 10:50 a.m.

S. No.	Name	Institution	Paper Title
1	Ms. Dimpal	KRCHE affiliated to GGSIP University, Delhi	Indian Perspectives on Mental Health, Motivation, and Human Behaviour
	Prof. Seema Sharma	KRCHE affiliated to GGSIP University, Delhi	
2	Dr. Mohammed Trique	MANUU, CTE-Nuh	Sri Aurobindo's Integral Education: Relevance for 21st Century Teachers
3	Ms. Vineeta Dhankar	Sanskriti University, Mathura	Role of Indigenous Knowledge Systems (IKS) in Teaching Competency
	Prof. (Dr.) Mahamud Khan	Sanskriti University, Mathura	
4	Ms. Swathi G	Sheshadripuram Academy of Business Studies, Bengaluru	Swami Vivekananda's Concept of Service: Implications for Social Entrepreneurship and Wellbeing
	Ms. Shubha S B	Sheshadripuram Academy of Business Studies, Bengaluru	
5	Mr. Mohammad Sajid Khan	IASE, Jamia Millia Islamia, Delhi	A Critical Analysis of Muslim Scholars' Contributions to Indian Knowledge System in the Context of NEP-2020

	Dr. Arif Mohammad	IASE, Jamia Millia Islamia, Delhi	
6	Ms. Rohini	Guru Nanak Dev University, Punjab	Indian Knowledge System and Artificial Intelligence in Education: Epistemic and Pedagogical Inquiry, Pedagogical Convergence, Cognitive Augmentation, Future Trajectories and Ethical Paradigms
7	Ms. Bushra	DOES, Jamia Millia Islamia, Delhi	Understanding the 'Rationalisation' of Political Science Textbooks: A Study of the Views of Subject Experts and Teachers
8	Ms. Moti Kumari Jha	MIT WPU, Kothrud, Pune	Indian Knowledge Systems as an Interdisciplinary Pedagogical Framework: Cultivating 21st-Century Skills through Indigenous Wisdom in the context of NEP 2020
9	Dr. Manvinder Kaur	GRDCE affiliated to GGSIP University, Delhi	Using Panchtantra Tales to Promote Reflective Teaching Practices
10	Dr. Arti Bhatnagar	GRDCE affiliated to GGSIP University, Delhi	Swot Analysis of The Integration of Indian Knowledge System in Social Studies Education
11	Mr. Md. Shakin Mulla	University of Delhi	AI and Digital Learning Platforms as Tools for Democratizing Indian Knowledge Systems in Teacher Education
12	Ms. Kulsoom Reza	IASE, Jamia Millia Islamia, Delhi	The Promises and Challenges of Generative Artificial Intelligence for In-service Teachers: A Systematic Review
	Dr. Aerum Khan	IASE, Jamia Millia Islamia, Delhi	
13	Mrs. Humairah Khatoon	IASE, Jamia Millia Islamia, Delhi	Integrating Traditional Teaching–Learning Practices in English and Physics Education: A Multilingual Perspective under NEP 2020
	Mr. Waqar Ahmad Khan	Awadh Girls Inter College, Kadja, U.P.	
14	Ms. M. Ramya	NIEPMD, Chennai	Integrating Traditional Knowledge Systems into Inclusive STEM Education for Children with Disabilities

15	Dr. Prerana Sharma Raina	KRCHE affiliated to GGSIP University, Delhi	Future of Work: Opportunities and Challenges Author

Report Presentation: Dr. Fozia Roohi & Dr. Nazia Hassan

Vote of Thanks